AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New Dredge Boiler.

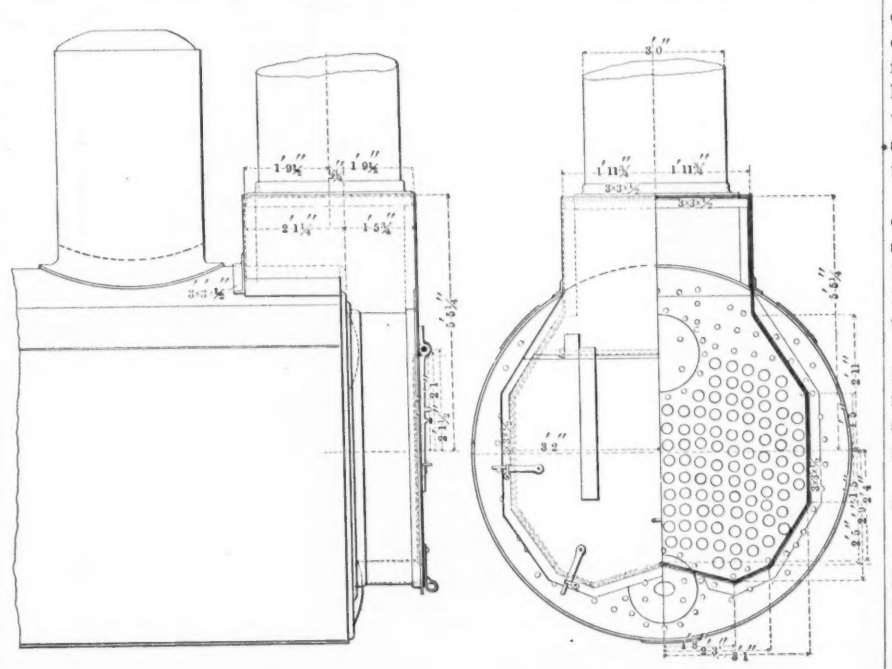
This boiler (pp. 1 and 2), is built to conform with certain restrictions regarding space, location in vessel, and to supply a large quantity of steam at irregular, intermittent intervals.

The boiler is an adaptation of the English naval type. It is to be placed in dredge No. 6, of the Atlantic Dredging Company. It was designed by Norman Wheeler.

There are two bodies, eight feet diameter, one containing tubes, the other 2 Scotch furnaces. The bodies are connected in line for steam and water by two necks going through the mid-connection, and for flame and gases by a mid-connection, lined with fire-brick inside a shell nearly as large as the bodies.

Brick bridge walls are built for the furnaces, inside the mid-connection, and a brick curtain wall deflects the flame downwards. A steam drum upon each body is connected by a neck similar in size to those connecting the two bodies.

The furnace body is built of steel $\frac{9}{16}$″ thick, and is 7 feet 6 inches long. The longitudinal seams are welded. Other joints are as shown by the detailed drawings.



of $\frac{9}{16}$″ steel plates, $5\frac{1}{2}$″ wide, from ends of connecting tubes, which project into the furnace body to the rings around the manholes, and are riveted to the stays and rings with $\frac{7}{8}$″ rivets in double shear, to the number and arrangement as shown in the engravings.

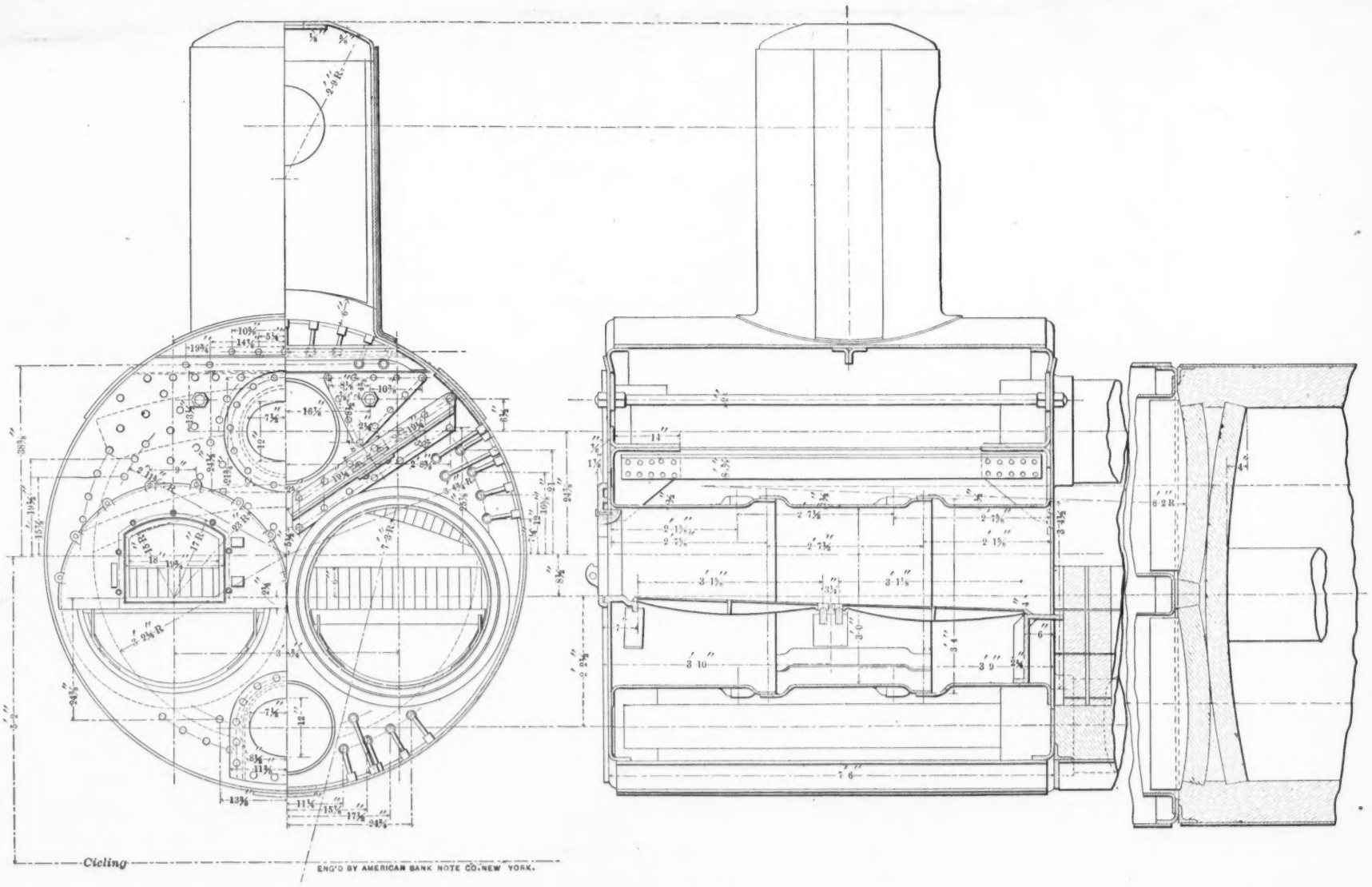
Above the furnaces, upon each side, is worked a flanged double-angle plate, $\frac{9}{16}$″ thick, as shown in the engravings. These plates are 14″ wide in the middle and tied together by 16″ x 8″ double plate stays, with $\frac{7}{8}$″ rivets, distributed as per engravings.

Above the angle plates are riveted triangular reinforce plates, $\frac{14}{16}$″ thick, which are tied from head to head by 2″ iron bars, with nuts and jamnuts at the ends, going all through reinforces and heads, and nuts set up outside.

The tube shell contains 182, 3″ tubes, outside diameter.

A 16″ hole is flanged in a nozzle plate of $\frac{7}{16}$″ steel plate to each drum, and a 16″ tube is lapped and single riveted to connect the two drums.

The furnace and connecting tube longitudinal seams are welded, and the circumferential seams riveted.



NEW DREDGE BOILER.

The heads are $\frac{10}{16}$″ thick, flanged and worked to 7′ $10\frac{7}{8}$″ in diameter. Each head is made in one piece, and required a sheet $8\frac{1}{2}$ feet square.

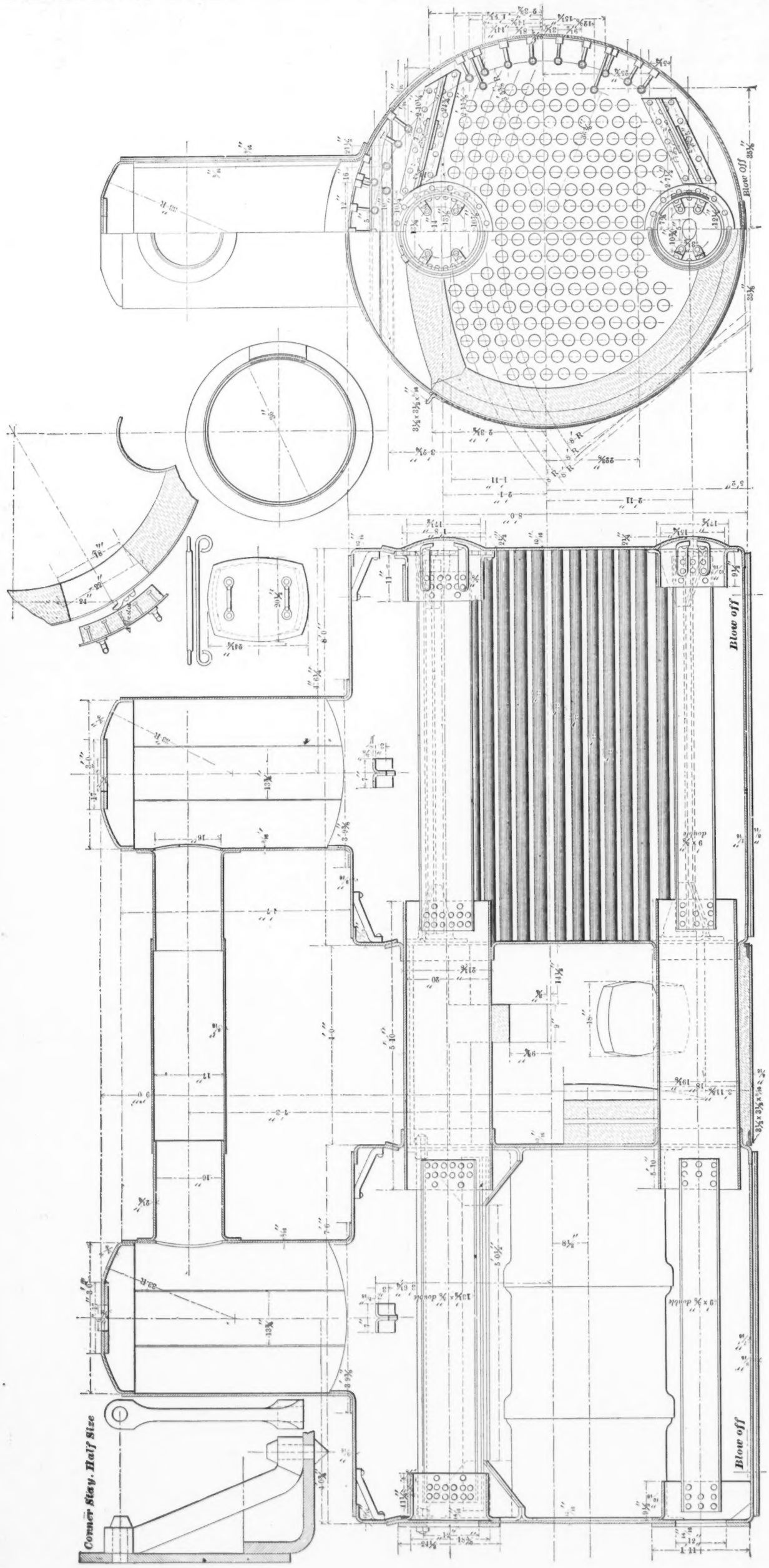
The steam drums are 36″ inside diameter, and 4′ 7″ high from top of shell.

On the inside of the front heads, and opposite the connecting pipes, $\frac{14}{16}$″ reinforce plates are worked on, as shown in the drawings.

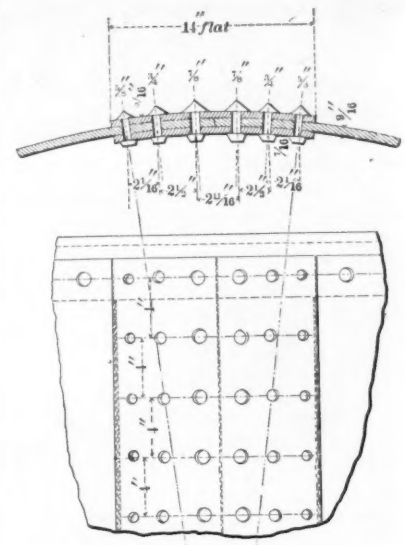
A double angle bar stay is shown in the drawings across the shell, under center of the drum. Each bar is riveted to the shell with 2″ rivets and 2″ pitch. The bars are flanged up from $\frac{10}{16}$″ steel plate.

Double plate stays extend upon each side

Upon the heads which face each other are worked segments of $3\frac{1}{2}$″ x $3\frac{1}{2}$″ x $\frac{5}{16}$″ angle iron, riveted to heads with $\frac{7}{8}$″ rivets, about $4\frac{1}{2}$″ pitch, and to these angle bars are worked the segments of a cylinder of $\frac{6}{16}$″ iron plate to the



NEW DEEDGE BOILER.—*See page 1.*



Longitudinal shell seams all like this.

height indicated in the engravings, the upper edges being stiffened with bars of $3\frac{1}{2}''$x$2\frac{1}{2}''$x$\frac{8}{16}''$ angle iron.

The grate bars have $\frac{5}{8}''$ face and $\frac{1}{2}''$ spaces, cast in pairs or threes, with end lugs separated by putting pieces of sheet-iron in moulds, by way of cores, to prevent warping.

All the steel plate used in the boiler is from Parker Brothers, Pittsburgh, stamped 60,000 T. S., and the boiler is tested for 125 lbs. per in. pressure.

These boilers were built at the South Brooklyn Boiler Works, Donald McNeil proprietor, Imlay and Summit streets, Brooklyn, N. Y.

Newark, N. J., Association, N. A. S. E., has elected the following officers for the ensuing year: President, Henry Halenbeck; vice-president, W. C. Tucker; recording secretary, Geo. E. Jones; corresponding secretary, J. J. Henderson; financial secretary, H. Kruysman; conductor, Geo. B. Thomson; door-keeper, Geo. E. Hart; trustees, J. Hartpance, C. C. Cornell, J. B. Smith; delegates to National Association, H. D. Cozens, J. J. Henderson, H. Halenbeck.

The transfer tables in use at the Chicago and Alton shops, at Bloomington, Ill., are operated by wire rope. Friction clutches are employed for both forward and transverse motion. These clutches are of the multiple disk form, requiring scarcely more than a touch to operate. It appears to be a very efficient and cheap method of operating.

Twist Drills Ninety Feet Long.

In the AMERICAN MACHINIST of May 1st. twist drills, 4" in diameter, were mentioned.

These drills, used in quarrying coal, were made by the Brady Manufacturing Company, Brooklyn, N. Y.

Twist drills, four inches in diameter and ninety feet long, were made some time since by the same company, for the United States Government, to be used in boring through the coral formations off Florida, for the purpose of establishing light-house foundations.

These drills were made in sections of ten feet each. They were made of bar steel, having a section shaped exactly like the iron girders used in stone fronts and other architectural work.

The steel is twisted while hot to the desired pitch. The lips of the drill were then swaged into shape by fulling with ordinary blacksmith's tools.

After being fulled, the drill sections were straightened, turned to size, and threaded to be screwed together.

Kind of Railroad Literature Wanted in Europe.

Angus Sinclair has received the following complimentary letter from S. Wittenberg, M. E., to the "Betriebs-Direction der Sudbahm," Budapest, Hungary:

"Being in charge of a round-house of the Southern Railway of Austria, I follow with great interest the literature in mechanical railway matters, and as I am a reader of the AMERICAN MACHINIST, I read with the greatest pleasure your articles about "Locomotive Engine Running and Management," which appeared there in 1884, and then as a book in 1885.

"There are a few books in the German literature also which deal in the same matter, but they compare with yours as the work of a poor country blacksmith to that of a high skilled modern mechanic; and above all they want the flavor of personal experience and observation.

"Dear sir, among engineers flattery is a bad thing—but I cannot but congratulate heartily you and all the English speaking engineers upon your able book, which no doubt is the best that was ever written on this matter, and I beg your permission and authority to reproduce it in German, that it may be known to all. You may be convinced that I shall do my best to reproduce as closely as possible that elegant diction and admirable clearness, which make the European reader doubt that the book has been written by 'one who has been there.'

"I hope you will not hesitate with your permission."

Mr. Sinclair left for Europe on the 26th ult. He will visit relatives in Scotland and make observations on British railroad mechanical practice. He will return in about six weeks.

Edwards' Improved Steam Trap and Improved Feed-Water Regulator.

The float trap herewith illustrated is designed for quickly discharging condensed water from steam pipes and coils. One difficulty hitherto experienced with float traps has been in the floats, which, being of thin copper, were liable to collapse. In these traps this is overcome by making the float of cast brass, cast in halves and screwed together. The water from the condensation of moisture inside the float is free to pass out through the tubular stem, thereby avoiding all danger. There are no stuffing-boxes to leak, and the water-gauge shows that the trap is working properly.

The following description will explain the construction and operation of the trap:

The pot *F* is a round cast-iron tank, made in two parts, and joined together with flanges. *E* is the discharge valve. *N* is the tubular connections between the discharge valve *E* and the float *A*. *B* is the inlet.

The discharge valve is shown in the enlarged view. It is a double-seated valve, hence balanced against pressure. It will also be noticed that the construction is such that no stuffing box is required, thus doing away with this cause of friction; this, with the balanced valve, nearly eliminates friction, which, when it exists to any extent, results in uncertainty of action.

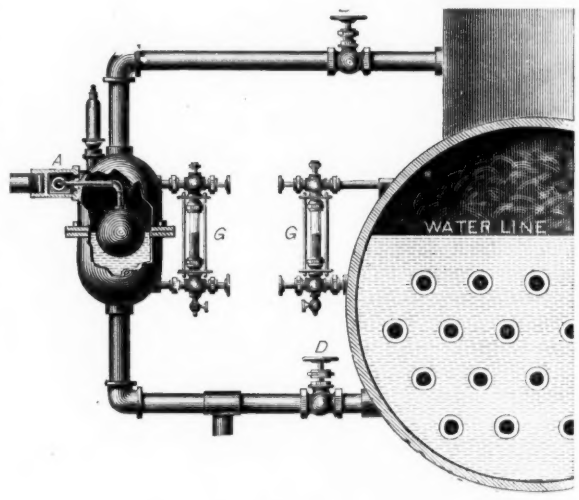
The small valve at top is provided to meet cases of accident; should the discharge valve remain closed, continue with the work and open the small valve, and by so doing the water can be drained off until such time as the cause of the difficulty is ascertained.

The glass water-gauge is introduced for the purpose of enabling anyone to observe, without guess-work, if the trap is working correctly; as when the gauge shows the water to be in about the center of the pot, which is several inches above the discharge valve, it is impossible that any steam can escape. We furnish these traps with or without these gauges.

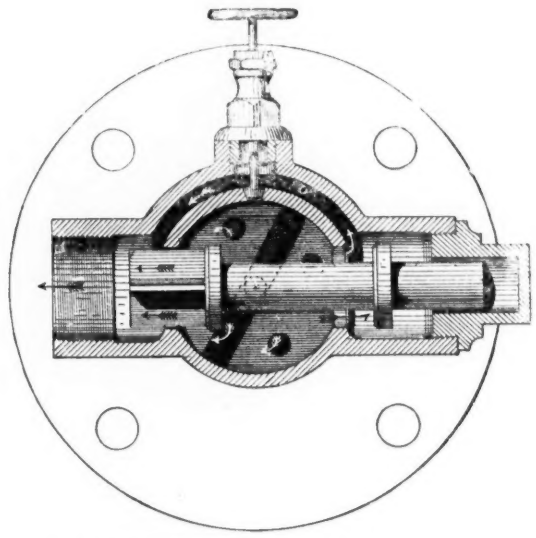
If the trap has been some time out of use, when steam is turned on, open the small air-cock on top, as by so doing the trap will instantly begin its work; but that is not absolutely necessary. If placed in a position where it will be liable to freeze when steam is turned off, leave the pet-cock on the bottom of the glass gauge open, in order that the water may drain out.

From the foregoing description it will be seen that in this steam-trap the water from the condensation of moisture in the float is free to pass off through the tubular stem and the channel in the valve, no matter what the position of the valve may be; that is, communication between the channel and the float is never cut off, because the valve opens and closes by a longitudinal sliding movement; at the same time the rising and falling motion of the float is not impeded by a stuffing box, and no space is left for the leakage of steam.

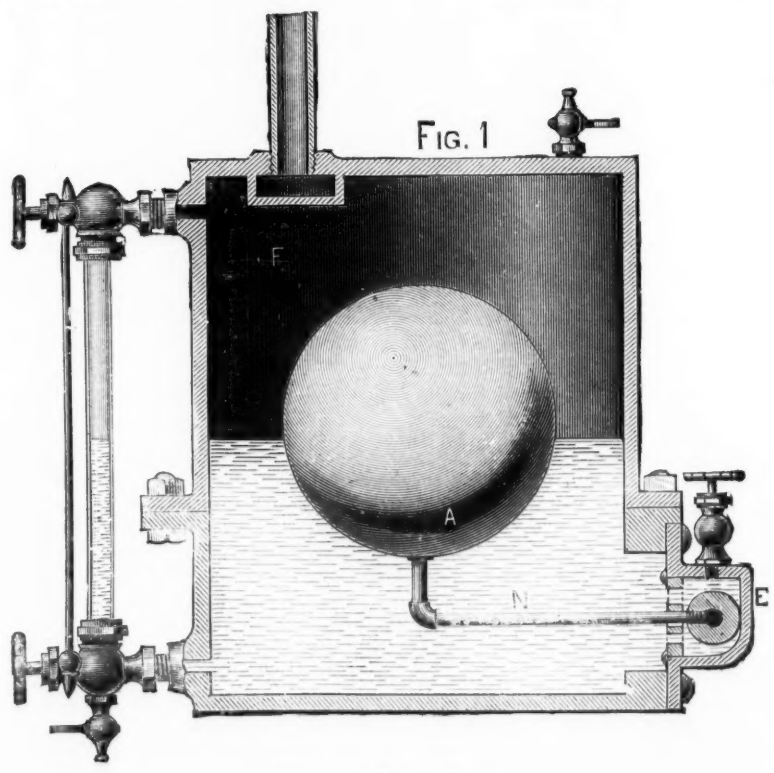
The feed-water regulator is designed for maintaining an exact water level in the boiler.



FEED-WATER REGULATOR.



SECTIONAL VIEW OF DISCHARGE VALVE.



EDWARDS' STEAM TRAP.

If the boiler is supplied by a steam pump, the regulator controls the speed of pump to the exact requirements of the boiler. If the boiler is supplied from service pipes in which there is sufficient pressure, then the water supply is controlled by the regulator to accomplish the same end.

An alarm gauge forms a part of every regulator. This consists of a steam whistle, which can be so adjusted as to give an alarm at whatever point it is set at.

The regulators are designed for use on any form of boiler. The float is similar to that previously described.

A. Aller, 109 Liberty street, is sole agent for the sale of these machines.

"When railway signals are properly lighted by electricity," says *The Engineer*, "they may also be worked by the same means."

Buying Second-Hand Machinery.

Before purchasing a second-hand machine, stop and consider why that machine was discarded by its former owner. If that machine was discarded for some defect of construction, then you do not want it. If it was displaced to make room for a similar machine of later design, capable of doing double the work performed by the old machine, then, surely, you cannot afford to buy the second-hand machine.

Before buying a second-hand tool or machine, establish some good reason why you purchase that machine to the exclusion of one which is new; which is capable of longer life; will need less repair, and which will probably do better work.

Inquiry at the Chicago and Alton Railroad shops as to why they did not use cast-steel rock shafts, brought out the information from Mr. Wilson that they could forge them for less money than they could buy steel castings. We found their practice to be, instead of making welds at the arms, to take two pieces the right diameter, draw an arm out on one end of each piece, then weld the round bars together to make the right length. Turning the arms up at right angles with the body concludes the forging. The weld being in the round part is easily made solid, and is subject to close inspection.

One of the outcomes of the establishment by the Erie Railway of its own express service will be appreciated by travelers. That is the checking of baggage to its destination in any city. This will do away with the "Baggage express," which is proverbial for delivering baggage anywhere from one to four days behind time.

The *Commercial Advertiser*, speaking of teaching drawing in schools and the importance of educating the hand and eye, very truly says:

The wealth added to the nation's capital by this development of the latent senses is incalculable. Those who are engaged in bringing out these hidden resources are as truly adding to the property of the country as those who are finding new mines or extending our commerce.

If it could be driven into the heads of more of those who control our public schools that there were a good many things that could be taught there that are not taught—things which would come under the head of "education"—it would be a good thing. To make room for these new branches, it might be necessary for educators to learn that many things taught in such schools, comprising a part of "education," could be omitted without any damage to the future prospects of the pupil.

Railroad freight cars, it is stated, can be weighed while in motion, and attached to a train running at full speed. The weight of each car is recorded by an electrical apparatus applied to the scales.

The delegates sent to China to work up railway developments in the interest of German capitalists and manufacturers, have reported that there is no chance for railway construction in China on a scale which could be made profitable to European enterprise until the Emperor attains his majority, which will not be until the close of 1887. The Viceroy assured them that China would build railways when she was able to manufacture the materials needed in their construction within her own dominions.

Using a Wooden Straight-Edge.

In many cases it is customary to level for a line of shafting with a common machinist's level and a pine straight-edge. If this method is followed, take care to reverse the straight-edge every time it is advanced a span.

By the above method, any error in straight-edge or level, is not multiplied by the number of spans leveled.

If by any chance a straight-edge be $\frac{1}{16}''$ widest at one end, and the wide end is kept in advance, the engineer will not have his temper improved by finding after the shafting is in place, that one end of it is $1\frac{1}{2}''$ higher than the other end.

No field is better covered by trade newspapers than that of milling. All of them appear to be well supported, but perhaps appearances are deceptive. Two of these have lately consolidated, and it would probably be good policy for some others to consolidate.—AMERICAN MACHINIST.

Our esteemed mechanical contemporary would doubtless revise its opinion were it thoroughly well-informed as to the character of the milling journals. It should not forget that the number of independent milling journals is very small, and of course the organs of rival furnishing houses cannot consolidate without curious clashings of antagonistic interests. The fraternity at large are protected by the independent papers. The private organs would like to see the independent journals go out of existence, because they could then dictate to the millers and rival furnishing houses as they might wish. Just now they are held in check by the existence of the widely read and outspoken independent journals. We think the milling trade-journal business is farther from being overdone than several other lines of trade journalism which we might mention.—*Milling World.*

We note that the "Cyclone Pulverizer" is being extensively advertised. Anything that will pulverize a cyclone should be in demand in the Western prairie districts.

Report of Master Mechanics Committee on Driving-Wheel Centers and Section of Tires.

To the American Railway Master Mechanics Association:

Your committee appointed at the Eighteenth Annual Convention to consider the subject of "Standard Diameters of Driving-Wheel Centers, and Standard Section of Tires," beg leave to submit the following report:

In considering the question of standard diameters for driving-wheel centers, we have thought best to recommend such diameters as would enable the largest number of locomotives now in use to be brought to the proposed standards with the least trouble and expense.

To enable us to arrive at proper conclusions, we caused circulars to be sent to each member of the Association, requesting information as to the diameters of wheel centers now in use on their respective roads.

We have received replies from thirty-eight of the leading roads, owning an aggregate of nearly 8,000 locomotives.

While we find a great variety of sizes of wheel centers, the variation is not so wide as to preclude the possibility of bringing a large percentage of them to a standard.

Your committee feels that this question is one of great importance, as well to the manufacturers of tires as to the railroads; as in the case of the manufacturers, the adoption of standard diameters of wheel centers by the railroads, will enable them to carry a stock of standard tires, which can be made up at their convenience; and in the case of the railroads, the necessity for carrying a stock of tires will be obviated, because manufacturers will be able to fill orders at short notice.

If desirable, manufacturers can furnish tires bored to gauges, ready to be applied to the wheel centers. This will be a substantial benefit to both parties.

In considering this matter, your committee believes it most practicable to establish the diameters of the wheel centers, making them even inches, and allowing fractional parts of the inch to apply to the diameter of the tires.

We would recommend for standard diameters of driving-wheel centers for the various sizes of wheels in use under locomotives of standard gauge, 38″, 44″, 50″, 62″ and 66″.

Your committee considers it unadvisable to take action in this matter with reference to narrow-gauge locomotives, as there are comparatively few roads of gauge other than standard, and those now in existence are rapidly changing, so that in a few years the railroads of this continent will be, with very few exceptions, of uniform gauge.

We would further recommend that arrangements be made with the Pratt and Whitney Company, or some other reputable manufacturer, to furnish gauges for both wheel centers and tires, to railroads, locomotive builders and tire manufacturers, at a reasonable price to be fixed or agreed to by a representative of this association, to the end that all parties in interest may have absolutely uniform gauge measurements.

Without such uniformity, it will be impossible for manufacturers to furnish tires bored to fit, with certainty that proper shrinkage is allowed.

We believe the requisite allowance for shrinkage to be one one-hundredth part of an inch for each foot of diameter of wheel center.

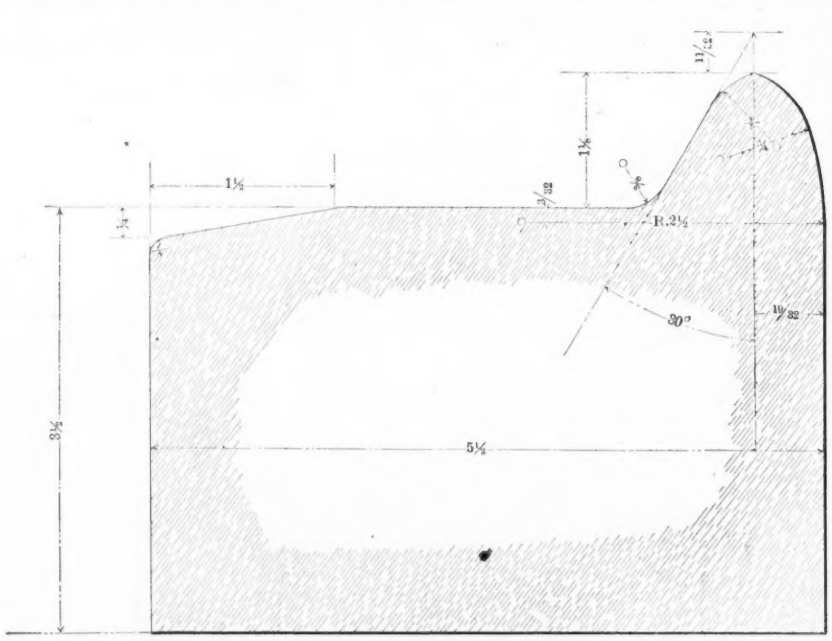
We have also prepared a drawing of section of tire, which we would submit to the convention for consideration.

J. A. LAUDER.
J. JOHANN.
H. W. SPRAGUE.

DISCUSSION.

Mr. Forney—I think that it is certainly a very important matter that we should adopt the best form of standard tread for locomotives. In the Car Builders' Association we have talked about it for several years past, and this year there has been another form proposed. It strikes me that it would be very unfortunate if the form of tread which will be used for locomotives should differ materially from that which will be used for cars. If you have a form of tread on a locomotive rolling over the rail which is of one shape, that would wear the rail in one position; then a car would follow with a tread of another shape, and that would wear the rail in another and different shape. I think it very desirable that this form of tread should be submitted to the members of the two associations. I think it would be quite impossible to get an idea of it from simply hearing its dimensions read. There is one point to which I wish particularly to refer—that is, the radius of the throat, which joins the tread to the flange. That, if I understand it correctly, is made only three-eighths of an inch. The throat which is proposed for car wheels is five-eighths of an inch.

Mr. Lauder—I would say, in reply to the main criticism of Mr. Forney, that it has always been thought desirable by most of the speakers, at the Car Builders' and Club associations, to have the radius of the throat considerably smaller than five-eighths of an inch, but the difficulty arose in the minds of those present that it would be impossible to get a chilled wheel with a much smaller radius, and yet get a good chill in the corner. It seems to be the sense of these bodies that the radius of that throat should be smaller than five-eighths of an inch. But here was a mechanical difficulty standing in the way, namely, that it was difficult to get a good chill in the corner with a smaller radius than five-eighths of an inch. That, we think, is the common judgment of the wheelmakers. We are discussing the locomotive driving-wheel tire. It is made of steel, and we can get any radius we please. We have submitted this plan for criticism and for adoption, if it is thought best to adopt it; but I am not at all sure that we ought to adopt any form of wheel tread at this time. I think, as Mr. Forney does, that there should be some uniformity between this



SECTION OF TIRE.

association and the Master Car Builders' on the question of the proper section of tire for engine wheels and car wheels. No matter what we put in for a section of locomotive driving-wheel tire, it remains that section only a very short time; so that, as Mr. Forney says, the engine comes along with one form of tread and the car follows with another, and it would only last a few weeks anyhow. There is a section submitted that I believe to be a good one. I would like to place before the association the matter of adopting and getting down to a uniform size of wheel centers. The more a person looks at it, the more desirable it appears that we should have these things, both for our own convenience and economy, and for the convenience and welfare of the manufacturers. We have recommended certain sizes. I will give the reason that led the committee to recommend those sizes. The first size is 38 inches. This, remember, is the absolute diameter of the wheel center. We must shape that, and then bring the tires to it. That can be used on special engines, light switching engines, or engines with small wheels, and then we increase these sizes by sixes until we get to sixty-two. We recommend 44, 50, 56 and 62. Then we increase by four inches to 66, in case anyone wants a special engine with a three inch tire. I believe that more roads will be able to bring their own rolling stock to those sizes than to any other sizes that we can adopt. I have in my pocket a list of the different sizes used on thirty-eight roads, generally the leading roads in the country, covering about 8,000 locomotives; and the largest roads are already put down for these sizes. The Lake Shore & Michigan Southern R. R. now report three of these sizes as being in use on their road. The Union Pacific, the A. T. & S. F. road, and such roads as that, have one or more engines with those sizes already in use. With reference to getting these sizes into use—railroads are slow about adopting these proposed changes—we have got to offer them some inducement to make this change. Now, that inducement, it seems to me, would be to get our tires at the manufacturers, turned or already bored. That would save us the trouble of boring the tires. I have no doubt but all the leading tire manufacturers in the country would be willing and anxious to furnish tires bored to gauge. That would induce every road to come to these standards at the earliest possible moment, so as to obtain the advantage of buying their tires already bored. For, if the roads use odd sizes they cannot get their tires without getting them especially rolled, or else have got to keep them in stock themselves, which is expensive. The recommendation we make about the gauges is a very important matter. There is no use in our establishing these sizes, and then letting every road in the country, every locomotive builder, every tire manufacturer make their own gauges; for it is a well-known fact that no two shops would make two pieces of steel nominally five feet long, and have them absolutely alike. Their measurements would vary; their measuring methods would vary probably to the extent of $\frac{1}{32}$ of an inch or more. Enough, certainly, to destroy the uniformity of the gauges that we adopt. Hence the manufacturers would not be safe in boring tires to any gauge they might, make and the railroads would not be safe in buying tires bored to any particular gauge, because they could not be certain that they would answer the purpose. If our recommendations were adopted, we should then know that everybody in the country had absolutely uniform sizes of wheel centers, and there would then be no risk in manufacturers of tires boring their tires, and having them ready to ship; and we could get a set of tires from the manufacturers about as quickly as we can now go out to our pile and select them, and probably quicker than if we kept the tires on hand. There is one size which had been suggested by several persons, which we did not mention in our report; it is 60 inches. I find that there are roads that have a wheel center of 60 inches, with a 3-inch tire, making a 5½-foot wheel. I have five engines of that size. I think it is a very desirable size of wheel for a mixed service. It is desirable for light passenger service, and it is a good size for freight in some cases, on some roads. If it is thought desirable by the members, that size might be added to the report.

Mr. Johann—I fully agree with Mr. Lauder that the first question for the association to settle is that concerning the standard diameter of the wheel centers, which, as a matter of course, will give us the internal diameter of the tires. There is no reason why each member cannot have his own peculiar shape on the outside. The main point is the establishment of standard wheel centers. This is a question that is important to railroad companies, and it is a matter of economy in the maintenance of the stock, and it is a matter which can be accomplished without any unnecessary expense. I have, on two occasions—in fact this is my third term—had the job of uniforming wheel centers. My first experience in the matter was in the ancient days of wrought-iron tires. I had charge of about sixty-five engines in the earliest days of railroading, before they were very particular about giving specifications. They would specify a 5-foot or a 5½-foot wheel; there would be nothing said about the diameter of the centers. Hence, we had no question about different diameters of practically the same wheel, which entails the carrying of a very large stock. At that time, in that western country, it was necessary, more than now, to carry large stocks, because transportation was not so expeditious as it is now, and you had to provide wheels in ample time if you wanted to keep your engines running. Hence I took the matter into consideration, got to buying smaller wheels, and seeing what could be done. Out of sixty-five engines, we brought them all, with the exception of about six, within the specified limits of the standard. These six we simply maintained as they were at first, and kept them as "specials." These were all uniform to the standard; and as fast as we received new tires the centers were turned to the standard, and instead of keeping from thirty to forty set of tires on hand; we never had a set of tires on hand Subsequently a steel tire came into use. At that time I was connected with the Wabash Railroad. We had a great number of engines of the older and ancient types, and of all sized centers, etc. I took the matter in hand; and when I left there, two years ago, they had 584 standard gauges, and their centers were all brought to the uniform standards, forty-four, fifty, fifty-six, and sixty-two. There were a few left that would not come to these sizes, and they were, as they were, simply carried along as "specials;" and when the engines were worn out then the whole thing was scrapped, and new engines procured. I hope the locomotive builders will have interest enough in this matter so that if these standards are adopted and provided, they having no specifications to the contrary, will build their driving wheels to these centers—which they can do just as well as not—and in a way that will ultimately establish a standard wheel center.

Mr. Forney—I move that the question of a standard form or tread be postponed. The Master Car Builders have under consideration the adoption of a standard for car wheels. According to their constitution, they must submit the matter to a ballot. I think this Association should wait the action of that Association before they adopt a formal tread.

The motion was carried.

Mr. N. E. Chapman—I had about twenty years' experience in the use of locomotive wheels, and have had some three years in connection with the manufacture of the same. While the size of the wheel is the most important to the road, the shape of the tread is of the most importance to the manufacturer. Now, when an order is sent in from the different roads, there are very few that are uniform. It is necessary that we should have a new set of rolls, which costs from $300 to $400, to conform strictly to the blue prints which we receive from the roads. It seems to me that it is important that not only should the size of the wheel center be adhered to, but that the tread should be as uniform as possible. That would enable the manufacturers to carry a stock on hand; and you, in ordering tires, could very promptly have your orders filled, not having to wait for them to be rolled.

Mr. H. N. Sprague—I would like to ask if any of the manufacturers are rolling that taper on a tire on the outer edge?

Mr. Chapman—Yes, sir; nearly all of the orders that are received at this time have that.

Mr. Johann—In regard to the matter of boring tires, I would say that for the last eight years, all the tires I have used, I have bought already bored; the gauge was furnished by me. I have never yet lost one tire out of at least 250 sets that I have put on during that time. I have had cases where an engine came in off the road at a regular trip, had the old tires removed, and new ones put on inside of four hours. We did not do so often, but we have done that on various occasions.

Mr. Sprague—I am getting all my tires bored to gauges, but once in a while we have to correct the boring, as we do not get the taper just right.

Mr. Chapman—I think the suggestion made by Mr. Lauder a moment ago, to have a set of standard gauges made by some manufacturer, an excellent idea. I think it would be necessary that each road should have a set of the same standard gauges.

Mr. Lauder—I would like to enquire of Mr. Chapman if he could give us any information in regard to what probable advance there would be in the price of the tires, if any, provided they were furnished bored to a gauge?

Mr. Chapman—Half a cent a pound in their weight after being bored.

Mr. Lauder—I would say that if we adopt these sizes, it does not make it obligatory on those ordering tires to order them bored, but it will become necessary for every railroad in the country using these sizes, for every locomotive builder and car builder to have a set of gauges to measure the center of the wheel and the tire.

Mr. McKenzie—I move that that part of the resolution which refers to the wheel center be adopted as the standard of this Association.

Mr. Sprague—I offer, as an amendment, that the 60-inch center be added.

Mr. Schlacks—I second the amendment.

Mr. McKenzie—If we go on and take up every 2 inches there is in the country, we shall be as far off from the end desired as we are now. I would be very glad to add a 42-inch center, because we have a great many engines with that center on them. But Mr. Lauder has said to me that these wheel centers can be enlarged to 44 inches.

Mr. Chapman—I know quite a number of instances where a master mechanic has desired to enlarge the size of his wheel centers, and has done it—in the putting in of new tires—by, instead of taking off the old tire, turning it down to the size that he desired and setting his new tire on that, making a shim or a band.

Mr. Cooper—I have some eight engines that I have increased the size of the wheel center by leaving the old tire on, turning the flanges off and setting the new tire over them. I have run those engines four years, and have had no trouble with them.

Mr. Lauder—From the information we derive from the replies to our circular, we find that it will be necessary in many cases to do that very thing in order to bring about this uniformity of which we speak. These sizes will accommodate, I think, by far a larger number of roads than any other sizes that we can adopt. As Mr. McKenzie says, it is chopping it up pretty fine to get a size in between fifty-six and sixty-two.

Mr. Johann—The object in establishing sizes is to reduce the number of different sizes, to have but one center of each specific diameter of wheel, that is, what you may term 4, 5, and 5½-foot wheels; and there is no question but these centers that the committee have recommended are the largest proportion to-day in operation on the railroads. What we want to establish standards for is for the locomotive builder to build his locomotive driving wheels to a uniform standard, all he builds; and for the tire manufacturer to know what size he can roll tires to and keep them in stock; and all those odd sizes that are in existence can still be continued as special sizes. I shall be very sorry if there are any more sizes added to those that are now given in the committee's report.

Mr. Sprague—On the evidence of Mr. Lauder, I assumed that the 60-inch center was a center that they did not propose to get rid of. I am perfectly willing to agree that it is policy to work out odd-sized wheels. If you are going to continue a 60-inch center, are you going to get rid of it by putting on a two-inch band? If there are any sizes that are going to be continued, it seems to me just as important to have them one of our standards as any other size.

The President—The amendment is that an additional standard of 60 inches shall be added to the six sizes recommended by the committee.

Mr. Sprague—Of course, the gentlemen understand that they are not obliged to conform to the 60-inch wheels if they don't have that size of wheel; it is only for a standard for those who have 60-inch wheels.

The amendment was then put and lost.

The President—The original motion now stands, that we accept the dimensions suggested by the committee: 38, 44, 50, 56, 62 and 66.

The motion was then put and carried.

The President—The question of tire is now open for discussion.

Mr. McKenzie—I move that the committee be continued for one year, to more fully consider the question of the tread of tire.

The motion was put and carried.

Mr. Sinclair—A gentleman connected with the elevated railroads has requested me to draw your attention to the fact that you have ignored the kind of machinery needed for elevated roads, and it is a growing kind of machinery which seems to deserve some attention from the committee. The sizes that you have recommended, or settled upon, are all too large for the elevated roads, with one exception (and they cannot be bound down to that size very rigidly), and he thinks that you ought to take it up and reconsider that part of the subject. As there are likely to be a great many more suburban and elevated railroads with small engines and small wheels, it seems a very important subject.

Mr. Johann—The committee would like to have the sense of the members as to what they shall do in reference to the gauge question. If we adopt the standards, it is very essential that we have standard gauges; and, in order to do this, we must make arrangements to have them manufactured by one concern. There is no question about that in my mind, for I have seen that thing tried over and over again, and you cannot get any two men to make a gauge just the same.

Mr. James T. Gordon—I move that this committee be instructed to make arrangements with some firm to procure these gauges.

The Secretary—I would suggest that the motion be amended for them to see what arrangements can be made. They would hardly want to make arrangements for a certain number of gauges until they knew what they were going to do with them.

Mr. Lauder—The procuring of these gauges is not for this association. It has simply to make arrangements, to instruct them exactly what they want, to let them procure drawings, submit them to this committee; and the committee will authorize them, whenever they give an order for gauges, to make that gauge, and make it at a certain price It is a very small matter. The gauges wont cost more than four-and-sixpence anyway.

The motion was then put and carried.

Mr. Lauder—We took this matter of narrow-gauge roads into consideration, and, there being so few of them, it was thought best not to make any effort to establish any sizes for them. There is probably but one narrow-gauge road to-day that will maintain its organization any length of time—the Denver and Rio Grande.

Making Elbows and Curved Pipes in Green or Dry Sand Without Pattern or Core-Box.

BY WM. STUART.

To make a pipe by this method, get two strips 1″ thick, sawed to the curve desired, and four half circles to make the flanges, the top pair having dowel pins, the under pair having pin holes to correspond with the pins. Bed in the flanges and level the strips, keeping the bottom strips even with the floor. Remove the sand from between the strips, put in some facing and sweep out with sweep 1.

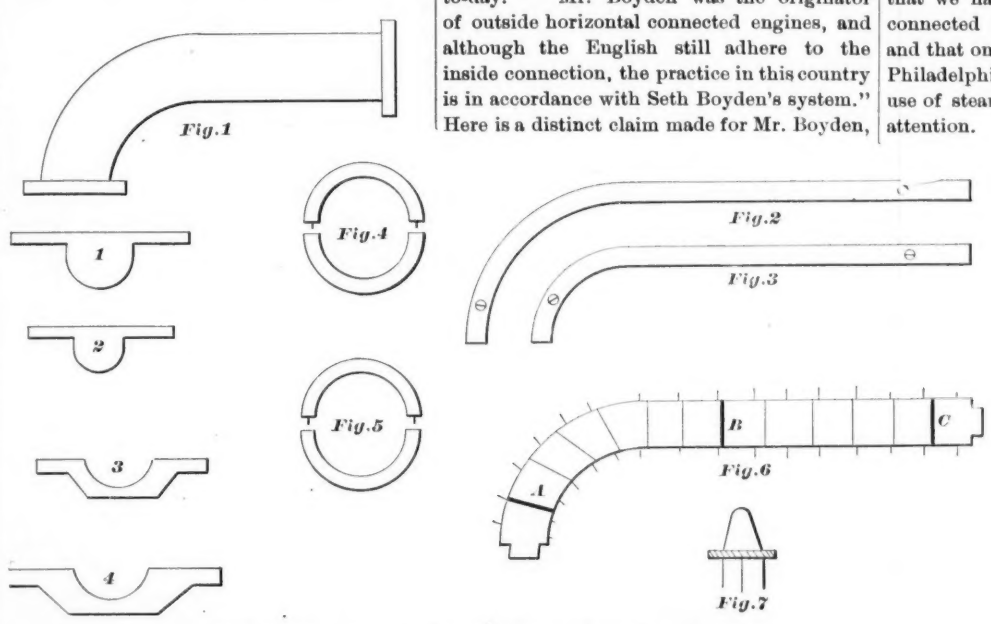
It will be noticed the sweeps are not half circles; the thickness of strips, 1″, is added to bottom sweeps, and taken off the top sweeps, to make a round pipe. After finishing with sweep 1, put on the thickness in black sand, and sweep with sweep 2; sweep past the flanges with 2 to make core prints.

After sweeping on thickness, put on some core sand, place the core iron, ram the core, and sweep it off with sweep 3; use 3 at each end to make core prints, put on thickness in black sand, sweeping off with sweep 4 between the flanges.

Remove the strips and the joint is made. Place on the top flanges, fitted to their place by the dowel pins. Put on the cope to come down on prints on each end.

After cope is rammed and taken off, lift out the core by staples, cast in core iron for that purpose at *A*, *B* and *C*.

The accompanying sketch will show the method more clearly. Fig. 1, an elbow pipe; Figs. 2 and 3, the strips; Figs. 4 and 5, the flanges; Fig. 6, core iron; Fig. 7, cross-section of core iron at *B*, 1, 2, 3 and 4 sweeps. This, I think, will be understood by any moulder.



MAKING ELBOWS AND CURVED PIPES WITHOUT A PATTERN.

In making a favorable report to the Dixon Crucible Co., of Jersey City, concerning the American graphite "Artist's" pencils made by that concern (as compared with the imported "Siberian"), and sent him for trial, Col. W. E. Barrows, general manager of the Dickson Manufacturing Company, Scranton, Pa., concludes with the following praiseworthy announcement: It is the policy of this company to use American-made goods when possible, and the effortsmade by the writer while manager of theWillimantic Company, in behalf of American-made goods, in dicate his personal position.

The *Baltimore Manufacturers' Record* publishes a letter from Milton, W. Va., saying that a mining company, whose principal office is there, is making tests of different kinds of tin ore, and the managers say the result is satisfactory. It is reported they will soon put up a furnace there.

LETTERS FROM PRACTICAL MEN.

Notes of Early Engineering Reminiscences.

Editor American Machinist:

After reading in your issue of June 5 the letter of O. C. Woolson commenting on my twentieth paper, I took up and read with care that paper, also the article of July 26, 1883, in the *Railway Age*, with wood-cut from the drawing of the locomotive Essex, to which I referred, after first explaining that the drawing was represented to have been made by the engineer who first ran the engine, and not by Mr. Boyden. I opened my paper by full extracts from the article in the *Railway Age*, which stated that in the years 1837 and 1838 Mr. Seth Boyden built three locomotives, the first built in the State of New Jersey. I will now again quote part of what appeared in the *Railway Age* and also in my paper: "These locomotives were built in 1837-8, and were named Essex and Orange. They possessed many practical features, many of which are embodied in all the locomotives of to-day." "Mr. Boyden was the originator of outside horizontal connected engines, and although the English still adhere to the inside connection, the practice in this country is in accordance with Seth Boyden's system." Here is a distinct claim made for Mr. Boyden, not made by Mr. Boyden himself: Had such a claim been made by Mr. Boyden, and it had come to my knowledge, I would certainly have called his attention to the fact of his ride on the America; the first locomotive built by my brother and myself, working under the firm name of Coleman Sellers & Sons. This engine had straight axles and was outside connected and had been in constant service on the Pennsylvania State road for fully a year at the time Mr. Boyden rode on it. I cannot believe it possible that he could have made such a sweeping claim. No living mechanic of his day stood less in need of fame other than what belonged to his well-known works. The high opinion my father had of him as an original inventive mechanic—the pleasure I derived from the few times I was favored by personal intercourse with him—make me loth to say anything that would detract from his rightly earned reputation as an inventive mechanic. If I have erred in my paper it has been in attributing to him important inventions in advance of their date; but of this further along. I would remind Mr. Woolson that in excusing my "having got dates mixed up and facts wrong" by "old age," that younger men sometimes make mistakes, and that there is nothing more difficult than to call the real facts in relation to priority in mechanical inventions, or in fact the truth of other important matters of history. I quoted in full from the *Railway Age* the paragraph in relation to the committee of experts, which being told in connection with the drawing of the Essex led me to infer that it was the first. Now in his letter Mr. Woolson gives some of their names, saying: "Among those experts was George Vail of the Baldwin Locomotive Works, Philadelphia.

In a previous paragraph he says: "But those who knew Mr. Boyden personally could never be made to believe he went there or anywhere else to gather information about what he had to construct; much less unbosom himself to others and tell what he was going to do before he had done it, and especially to Mr. Stephen Vail, who was then a director in the M. & E. R. R. and father of George Vail, a member of the firm of Baldwin & Co., Philadelphia."

Let us turn to the history of the Baldwin Locomotive Works from 1831 to 1881, as published by J. B. Lippencott & Co., on page 18, we find: "April 8, 1839, Mr. Baldwin associated with himself Messrs. Vail & Hufty until 1841, when Mr. Hufty withdrew and Baldwin & Vail continued the copartnership until 1842." As a matter of fact George Vail could not have been a member of the firm in 1836.

I do not see in my reference to Mr. Boyden going to Vail & Son anything that could be construed into an intimation that he had gone to "gather information" other than what was doing and had been done (certainly a wise course on commencing a new enterprise), and that he had there learned that Baldwin's half-crank had been patented, and that we had built and were building outside connected locomotives with straight axles, and that on that information he had come to Philadelphia. At the time of his visit the use of steam expansively was receiving great attention. What I have said in relation to his ideas of long stroke engines and expansive steam I have nothing to add. His call at our city office was after noon.

I took him out to our shops; he remained with me overnight, and returned with me to the city the next morning. When at the shops he appeared to be much interested in the manner we bent and welded the straight flange tire we imported from England, and asked or and took the address of the agent it was imported through. Our hollow wire wheels, with compressed wooden fillings, were also a subject of interest. I am now surprised to learn from Mr. Woolson's letter that this might have been only a matter of curiosity on his part; that it was his intention from the start to make cast-iron wheels, which he did, "nicely turned and fitted to straight axle, turned the whole length." During the ride out to our shops, several hours at them, the evening at my house and the return to the city the next morning, the chief subject of conversation was locomotives and expansive steam, which made a lasting impression. We all know early impressions grow upon us until they assume the form of facts. What follows will explain my meaning. The stress laid by Mr. Boydon on the value of using steam expansively, the moving of a connecting pin on his card, made to demonstrate the change in point of cutting off, left on my mind the impression that he contemplated giving the runner of the engine command of the cut-off, thus, "in a measure, anticipating the present link motion." Now we are told that all the cut-off he contemplated was what was due to the lap of the valve; then, as to the link, we are told that no one "is justified in qualifying this matter one iota." "The attachment subsequently put on the 'Orange' and 'Essex' was what is known as the closed link—nothing more, nothing less—and it was found successful; so much so that every locomotive built at this day has a link in some form." Now, if this link was only for the purpose of reversing, and not for the regulation of the valve to cut off, it was no link at all, as we now understand; the link moved by eccentrics, giving the engineer the command of the steam by the position he places the link in connection with the valve; and during all these long years I have been wrong in believing and representing to others my belief in Mr. Boyden being the originator of this most important device. The command of the cut-off by the hand of the engine-runner is a very different thing from automatically accomplishing it by a governor, which might be ten or more years in following. The

wording of the commencement of Mr. Woolson's description of the valve gear first applied to the "Orange" is calculated to give a wrong impression; he says: "These flanges, with the sockets at the extremity of disk, were possibly the first conception of the V hooks used by Rogers about 1839."

It is more probable that the V hooks in use on the English locomotives as early as 1832 gave rise to the oval disk that accomplished the same object in substantially the same manner. When in company with Wirt Robinson in that year, I visited English locomotive builders, and he contracted for some engines for the Richmond and Fredericksburgh Railroad, of Virginia, being sent to England for that purpose by his uncle, Monture Robinson, then chief engineer of that railroad. The V hooks were a feature of these contracts. In December of that year Mr. W. Robinson and myself sailed for home on the ship Algonquin, on which was shipped one of these engines. We have living here an old locomotive engineer whom I have frequently heard say that he had run this engine on passenger trains. To guard against mistakes of memory that might occur from old age and a lapse of over fifty-three years, I have asked him, who built this engine? His reply was, "It was a Berry engine." What was the arrangement of its valve gear? "Double eccentrics, with V hook reverse, the V drawing the arm of the valve rockshaft into position without hand levers, as were used at that time on the Baldwin engine, with its flat hooks."

From the general tenor of the conversation and illustrative sketches made during the evening at my house, it was evident that Mr. Boyden had given much thought to the advantage of the driving wheels back of the fire-box when a single pair was to be used; also as to the value of width of fire-box; he was unstinted in his praise of Baldwin's half crank, as without it, or by using outside connections, they could not be placed there without sacrificing width of fire-box. Coupling this with his remark that Baldwin declined granting rights to use his half crank, gave me the impression that he had contemplated using them before the idea of outside connections had assumed definite shape in his mind. I now believe that his question as to patents, though a general one, had special reference to straight axle and wrist connection to the driving wheels.

Before Mr. Boyden, with Mr. Brandt, rode on our engine, I clearly explained to him the difficulties we had encountered and overcome in inducing the Canal Commissioners to permit the engines to be built with outside connections, iron frames and center carrying truck—all innovations of the system of the time

In Mr. Woolson taking exception to my saying, "If Mr. Boyden was now living he would be the last man to claim outside connected engines as his system;" he should have quoted the entire paragraph, for in it I distinctly disclaim outside connections as my invention, but I did claim that their "practical introduction into our American system of locomotives devolved mainly on me." That is all there is about it, and for the history of which I refer to my 16th and 17th papers; for making this just claim I am accused "of poor taste and void of grace."

I will now again refer to the published history of the Baldwin Locomotive Works, but before quoting I would remark that Mr. Henry R. Campbell was an intimate personal friend of mine, and was at that time engaged in constructing a branch of the Pennsylvania State Railroad to avoid the inclined plane, and frequently rode to the point of junction on our outside connected engines, and that he was one of the party on our exhibition trip to Lancaster and return in the fall of 1835.

"Mr. Baldwin's engine had a single pair of drivers placed back of the fire-box; that made by Mr. Morris, one pair in front of the fire-box. An engine with two pair of drivers, one pair in front and one pair behind the fire-box, was the next logical step, and Mr. Henry R. Campbell, of Philadelphia, was the first to carry this design into execution." * * * "February 5, 1836, Mr. Campbell secured a patent for an eight wheel engine with four drivers connected, and a four wheel truck in front, and subsequently contracted with James Brooks, of Philadelphia, to build for him such a machine. The work was begun March 16, 1836, and the engine was completed May 8, 1837. This was the first eight wheeled engine of this type, and from it the standard American locomotive of today takes its origin." In the *American Journal*, of July 30, 1836, is a wood cut showing Mr. Campbell's engine.

The same historian states that Eastwick & Harrison constructed a locomotive on the same plan in 1837. "Subsequently Mr. Jos. Harrison, Jr., of the same firm, substituted 'equalizing beams' * * * in the same manner as since generally employed.' All these engines were outside connected with straight axles, and shows with what rapidity they were adopted after their utility was once demonstrated. In the same history occurs: "In March, 1839, Mr. Baldwin's records show that he was building a number of outside connected engines, and had succeeded in making them strong and durable," also that on his 136th locomotive the wooded frame was abandoned, and "the wooden frame thence forward disappeared gradually and an iron frame took its place."

Our first locomotive went into constant service on the Pennsylvania State Railroad in the fall of 1835. We subsequently built three others, two of which went on the same road and one on the Baltimore & Susquehanna, and all of which were outside connected with iron frames, and the weight of the front end carried on center of the truck. Campbell's patent for four connected drivers and four wheel truck bears date of February 5, 1836. The work on one commenced March 16, 1836, finished May 8, 1837. Eastwick & Harrison built one on the same plan in 1837, both of which had straight axles and outside connections.

These facts point to Philadelphia as the place where the American system was inaugurated, and that the system had been so far established, that in 1839 Baldwin was building a number of outside connected engines, whereas, Boyden's engines were built in 1837-38; and, if my memory is not entirely at fault, Mr. Thatcher Perkins was working on outside connected engines during these same years of '37 and '38.

In regard to my father's leather splitting machine, I spoke of Mr. Boyden having come to Philadelphia to see, I had no conception that my words could be susceptible of the interpretation Mr. Woolson has given them. The facts are simply these: My father had constructed two leather splitters, one for machine card leather with its marble cylinder, which I described. The other with a cast-iron cylinder was for large sides of leather for hose and mail bags, and not as a new industry. The card leather splitter was a perfect success; that for the large size a failure. My father requested me to see to having some leather prepared for both machines; that at such a time he expected Mr. Boyden, and he wanted me to be on hand to meet a man he held in such high esteem as an inventive mechanic. I was present at the working of the machines, and from what I now recall of the conversation, I think it most probable that my father was acquainted with what Mr. Boyden had done in the leather splitting line, and that they had either personally, or by letter, conferred on the subject of the big cylinder. I judge this from suggestions made by Mr. Boyden at the time, and also those made by letter. It was simply an interchange of ideas, one mechanic helping another. The most of that evening was spent with Mr. Boyden and my father at the old Philadelphia Museum.

GEO. ESCOL SELLERS.

That Defective Air Pump.

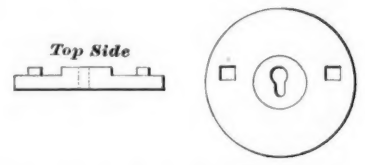
Editor American Machinist:

I have read with much interest the different suggestions given to T. Paxton in answer to his air pump questions of May 29th. As I have had some experience on air pump work on this road (the Maine Central), and experienced the same difficulty that Mr. Paxton mentions, I will add my "mite" to the others.

For lift of valves we give receiving valve $\frac{1}{8}''$, discharge valve $\frac{1}{16}''$. But I do not think the difficulty is in the air, but in the steam cylinder. The parts sometimes vary a trifle. In this case the reversing valve stem should be $12\frac{3}{4}''$ between knob on end and part that goes through bottom of top cylinder head. I have found some $\frac{3}{64}''$ longer, and some as much shorter than that, and with the latter I have never known the pound to be on the down stroke. When the reversing valve plate becomes worn on the bottom side we usually upset the stem from $\frac{1}{32}''$ to $\frac{1}{16}''$, so that when the main piston goes down it will pull the reversing valve down before the piston head strikes the bottom, and will let in steam for it to cushion on

Let Mr. Paxton try upsetting the stem, only taking care not to upset it so but that the stem will be loose when the piston head is down on the bottom.

Another difficulty is, sometimes the piston head strikes on top. We have remedied this in one case by facing off the boss that is on



the center of top cylinder head where reversing stem goes through, and making a reversing valve plate of this form. This stopped the "pound," which was evidently caused by the pump not reversing soon enough on the up stroke.

W. B. SMILEY.

Waterville, Maine.

A Cause for Lard Oil Becoming Flaky.

Editor American Machinist:

I have found that lard oil will flake in a can made of zinc, or having any zinc about it with which the oil will come in contact. The same oil will not flake in a can made entirely of tin. Perhaps this may explain the trouble your correspondent experiences. I do not know why the zinc operates as explained; probably a chemist could tell. I have experienced trouble of the kind named even when there is but very little zinc used in the construction of the can; hence my plan is to throw all such cans in the scrap heap.

S. BREEN.

Marshall, Tex.

Editor American Machinist:

In the AMERICAN MACHINIST of June 26, I saw an article in your paper on making long spiral springs. Where I am employed, we make an article which takes a spring about 2″ long.

When we first started, I wound the springs on a rod, but found that was slow, so I devised an attachment to a lathe by taking a pair of gears, turned two steel rolls and mounted them on two parallel shafts. I grooved the rolls to fit wire and fed the wire between rolls into a steel nut which had 2 threads of the proper pitch.

The length of wire is the limit to length of spring. I send you a sample cut from the end of a 66″ length. We use three sizes of wire, Nos. 12, 13 and 14.

C. OWEN.

That Friction Question.

Editor American Machinist:

So far as ordinary practice is concerned, friction between moving and stationary parts of machinery tends, of course, to stop all motion. (No originality claimed.)

But if by accident or design the minute-hand of an ordinary detached lever escapement watch be caused to rub around inside the crystal, so as to nearly, but not quite, prevent the movement from running, a miracle takes place.

For friction seemingly gives, under these circumstances, sufficient renewed energy to the machinery inside to cause it to register one hour every forty-five minutes.

This result is due, of course, to the fact at, as most of the force of mainspring is th consumed in overcoming this excessive friction, the lever is very feebly worked, the balance makes short and rapid oscillations, and so allows the teeth on scape-wheel to pass sooner than when the balance has full swing.

In reference to the article and sketch (page 6, issue No. 25) by U. Short, removing the weight from wheel *A* to collar *C* does not diminish the pressure between *A* and *B*, but gives an additional pressure of 1,000 lbs. between *C* and *A*, and consequently double the original force will be required to move *A*.

Perhaps the writer has thoroughly digested that worm-wheel, thrust-bearing and screw problem by this time; and regarding that shaft and pillow-block query, one would naturally return to the first sketch for a solution, as the conditions are exactly similar. Or, to a reader familiar with hoisting machinery, wouldn't two brakes applied to opposite sides of a drum, with a force of 1,000 lbs. on each, be more effectual than 1,000 lbs. applied to one brake? Would it lessen the efficiency of two brakes if by a little ingenuity the one force of 1,000 lbs. was made to do for both?

W. H. CHAPPELL.

Chicago, Ill.

Information About Pipe Threads.

Editor American Machinist:

I notice your request for information on English pipe threads, etc. I copy from my table of universal gears—pipe threads:

Diameters.	Threads to the Inch.
$\frac{3}{8}$	18.412
$\frac{3}{4}$	14.
1	14.
$1\frac{1}{4}$ and all above.	11.294

I have a set of gauges from England bought two years ago, and they have no taper. I have information, however, that Messrs. Lloyd & Lloyd are now using the same taper that we use here, *i. e.*, $\frac{3}{4}''$ to the foot. The form of threads is a full V. I have sent many machines to England for 2″ and over, but have always been directed to make them for 11 threads to the inch, and never to the fraction given above. I am, dear sir,

W. D. FORBES.

Kind of Work in an Iowa Machine Shop.

Editor American Machinist:

A train of gearing was recently set up in our shop, and called a "motor." There were six pairs of gears, and each pair was geared six to one. One revolution of the main driving shaft produced $6\times6\times6\times6\times6\times6$, or 45,456 revolutions of the shaft, from which power was intended to be taken to run a churn or a sewing machine. There is a governor geared up from this shaft four to one. Six revolutions of the first shaft revolves the governor more than a million times. The relative speeds of the extreme shafts in the machine, exclusive of the governor, may be represented by swinging a lever on fulcrum, which may be placed $1\frac{3}{8}$ inches from one end of the lever and one mile from the other.

Among other inventions which we have handled in the past few months, may be mentioned a baby jumper, a sheet music turner, a type writer, a corn planter, a counting machine, a steel bird, a rotary engine, a wind-mill, a car coupler, a perpetual motion machine, and, finally, a spool and ratchet arrangement to carefully lower us into the grave when we shall have finished the battle of life.

J. E. MCCONNELL.

Des Moines, Ia.

Fixing an Air-Pump.

Editor American Machinist:

I belong to the much-scalded and otherwise burned brigade that works about Westinghouse air-pumps, hence have been interested in the discussion in regard to them that has been going on in the AMERICAN MACHINIST. When called upon to go to the coal pile, or some other equally convenient place, I take along a box of tools which I have got together for that purpose; frequently I need them all, and more besides.

I was recently called, just before washing up time, to wrestle with a pump similar to the one mentioned by your correspondent

The differential piston valve and reversing piston were all right. I then unscrewed the nut over the reversing valve rod, gripped the end of rod with a pair of tongs and drew the piston up where I could examine it, holding it up by tightening the nuts between the cylinders. I found when the piston was down the valve rod had more than $\frac{1}{8}$-inch play. Taking off the bottom head of air-pump, I found that the pin through the nut on end of piston rod was gone, and that the nut had unscrewed about $\frac{1}{4}$ inch, thus striking before the piston pulled down the valve rod. Remedying this defect made the pump run all right.

GEORGE HOLMES.

Troy, N. Y.

The Feed-Water Question.

Editor American Machinist:

Although like Mr. Coffin, I generally sympathize with the under dog, I can't agree with his arguments, wherein he claims to prove that with good automatic non-condensing engines, cutting off at quarter stroke, the exhaust leaves the cylinder with considerable superheat.

Taking his own proof, as far as it goes, he has for each pound of steam exhausted twenty-six units of heat above saturation. But he has overlooked one important factor that always comes into this problem, *i. e.*, the conversion of heat into work. This is not so insignificant a factor as many suppose, though ignored to a great extent by engineers themselves.

Work cannot be accomplished without an expenditure of heat, one unit of heat being equivalent to 772 foot-pounds of work. The power of one horse working one hour is equivalent to $33,000 \times 60$ or 1,980,000 foot lbs., or 2,564+ units of heat.

Under the conditions named in Mr. Coffin's illustration, and in fact many actual cases, each horse-power will use about 25 lbs. of steam per hour. So it is plain to see that each pound of steam under these conditions must supply 100 units of heat, which disappear (as heat) and are converted into work. Thus we find ourselves still short about 75 units per lb. of steam exhausted.

The last space in Mr. Coffin's table should be marked "saturated steam and more water," remembering throughout the effect of the cylinder walls is disregarded.

Taking actual conditions, however, the exhaust steam is undoubtedly much dryer than I have shown it, as the effect of the cylinder surfaces is to give back absorbed heat and re-evaporate the water during more than half the time, namely the latter part of the steam stroke and all of the exhaust stroke. Still, however great or small this effect may be, the exhaust cannot carry out more heat than is brought into the cylinder, and it must always lack that portion transformed into work.

There is also another point made in Mr. Coffin's letter that will bear some investigation. He states that each pound of exhaust contains 997 more units of heat than is necessary to heat the feed-water from 60° to 212°, and that with such a great surplus we may reasonably expect to heat the feed above the boiling point, which some heater men claim has actually been done. No one will dispute that superheated exhaust has a temperature above the boiling point, and though I don't believe such a thing ever occurs in practice, I will admit for illustration that we have a case of ten units superheat, and the units of heat necessary to keep the exhaust at point of saturation or in plainer terms, to keep it in the form of steam, in all 10+1,147 or 1,157 units per lb. of exhaust, of which 152 units are required to heat a corresponding pound of feed water from 60° to 212°. Which will be the first heat lost from the exhaust? He can't get any of the big pile (1,147) until the ten units on top are removed, for to get any of the 1,147 some of the steam must be turned to water. This cannot occur while its temperature is above that of saturation, or boiling point. The only way possible would be to have a separate heater fed with water previously heated to 212°, and supplied direct from the cylinder with the superheated exhaust. The 10 units would not be available in any of the single exhaust heaters now in use, and only part of it could be captured in the double arrangement suggested.

The foundation idea of "superheated exhaust" seems so improbable, however, that it is hardly worth studying up plans for its utilization. While I would not presume to dispute that feed-water has been heated to 216° or higher, I do not believe it was done with steam at 212° as the heater men would have us believe. I would greatly like to know if in such a case, the exhaust also leaves the heater at a temperature of 216°?

If it leaves at a lower temperature, what prevents the feed-water giving back some of its heat to the out-going exhaust, down to the temperature it does leave at? From the construction of the heater in question, I cannot see how it is possible for the steam to leave it at a temperature any below that of the feed-water.

I don't believe water will flow higher than its source, and it is as hard for me to understand how a boy could lift himself three inches by his boot straps, as to lift himself clear over the fence by that means.

It is equally hard for me to believe that any feed-water heater can heat the water until it is hotter than the exhaust going through it.

Dunkirk, N. Y. F. B. RICE.

About Friction.

Editor American Machinist:

If you will permit me I would like to say a few words in answer to communication of U. Short in AMERICAN MACHINIST of June 19, entitled "Something about Friction." In the first place your correspondent seems to misunderstand the application of the law of friction, which is, "Between perfect surfaces, extent of surface without increase of pressure does not affect friction." To illustrate: suppose the surface at D in his diagram to contain four square inches, then each square inch will support 250 lbs., and will absorb one-fourth of one horse-power; but suppose the same bearing be increased to twice the area, or eight square inches, although there is twice the number of square inches to produce friction, each square inch receives only half as much pressure, that is 125 lbs., and hence absorbs only one-eighth of one horse-power, and the whole surface would, consequently, require only one horse-power to drive it as at first.

In the case under consideration the circumstances are not the same, as placing the weight upon the collar C, adds another frictional surface similar to D, and bearing same weight without taking any weight off D. The law in this case is that in a structure any point must bear the weight of all the material above that point. Hence, while the surface between A and C bears the 1,000 lbs., surface D must also bear the same, not to mention the weight of wheel.

The man who rode a horse to mill and carried the sack of wheat on his shoulder to favor the horse, illustrates the lack of knowledge of this principle very forcibly.

It is evident that while we have not removed any friction from surface D, not having made any change either in pressure or extent of surface at that place, we have added another frictional surface of equal extent and under the same pressure; hence, we must have doubled the friction, and will require twice the power to overcome it.

The same reasoning will hold good in regard to the shaft revolving in bearings. The bearings upon which the shaft rests must bear the extra weight and the friction attending it, no matter in what way it is added to the shaft; but if it is placed upon the caps so that, in addition to pressing the shaft down on its bearings it presses the cap down on the shaft with a pressure equal to its own weight, we have the extra friction between the cap and shaft to add to what we would have if the weight were applied to the shaft so as to revolve with it.

In regard to the worm wheels, aside from the question of friction, the power required to drive them will be the same whether they turn in the same or in opposite directions, but supposing all the surfaces to be equally perfect the friction will be just twice as great where both wheels revolve in the same direction as where they revolve in opposite directions.

C. E. MCMURPHY.

Fort Madison, Iowa.

Parallel Elliptic Lines.

Fig. 1 is given to explain the impossibility of drawing elliptic lines equi-distant. If two elliptic lines $M\,J\,K$ and $N\,G\,L$ be drawn, they will not be parallel, for the reason that the trammel rod in its movement between the minor and major axes describing the ellipse is nowhere in a position normal to the curve. Although $K\,L$ and $M\,N$ are equal, it will be found that the elliptic lines $M\,K$ and $N\,L$ are much nearer together when the rod $O\,H$ is at about the point G, measuring on the normal line $G\,J$.

Fig. 2 is introduced to show an instrument that will describe a parallel line to an elliptic line. This instrument was suggested by Mr. J. C. Babcock, superintendent of the Mechanics and Tradesmens Free Drawing School of this city. The drawing sufficiently explains the mechanical construction of this implement. It operates as follows: At the face $A\,A$ are pins to which the thread is attached at the underside, and connected also at the underside of the pivot E. Place the pencil's point through the hole at B, and move the instrument either way to describe the line $D\,D$, which will be equi-distant or parallel to the elliptic line already drawn.

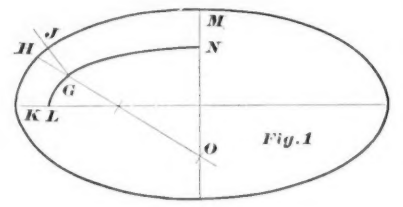


Fig. 1

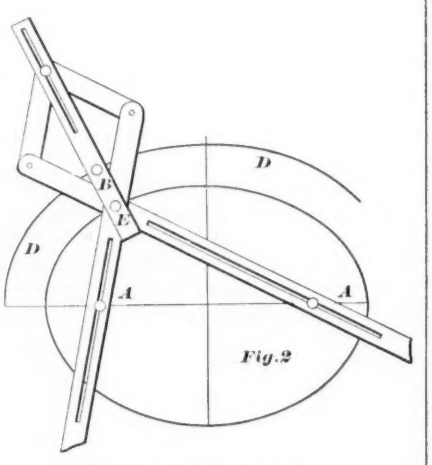


Fig. 2

PARALLEL ELLIPTIC LINES.

Trade With New Zealand.

A New Zealand correspondent of the *Ironmonger* (London) writes:

* * * There is no sentiment in business. We should prefer to do business with you, but you must not ask us to take badly-finished, old-fashioned goods, which, no matter how well they satisfied our forefathers, will not do for us. Would you be surprised to hear that no carpenter in New Zealand will use (from choice) an English hammer, saw, brace, or auger-bit? No buggy-builder will use English coach-bolts and tire-bolts if American ones can be obtained, even at 10 per cent. more money than the English, because he can pick up a Yankee bolt and apply it immediately to his work, and with its nice square-cut thread there is less chance of nuts becoming loose.

What is the case with the English bolt? He will search a gross over, and find every nut "jammed" so hard on the bolt that it has to be taken to the vice and there oiled and eased. This takes time, and, as time is money, he cannot be blamed for preferring the Yankee article. * * *

This writer also remarks:

* * * I shall not touch upon the American axe question more than to say that the loss of trade to England is through sending rubbish out at first, and not caring to be gulled by our own kith and kin, who ought to have known better, we went elsewhere for what we wanted, "and got it." * * *

Electrical phenomena is supposed to increase in intensity when the air is heavily charged with dust, and it is claimed that accidents from lightning have increased three to fivefold during the past fifty years, owing to the increase in manufactories and other fuel-consuming plants, which fill the air with smoke, steam and particles of dust.

Liquid Fuel Burners.

The *Sanitary World*, in speaking of liquid fuel burners, says that nearly all the burners brought forward have used steam as an agent for spraying; it calls attention to the loss of water consequent upon the use of steam for this purpose; and brings up the merits of using compressed air for the purpose. The *World* further says:

"Recognizing the fact that an intimate mixture of the combustile with the air supply is an essential requirement of thorough combustion, it is not difficult to understand why the air atomizer should receive special consideration. Heating and regulation of the air supply can be readily accomplished with it, and lend additional weight to its claims. It is of interest to note, therefore, that in France the air atomizer is regarded with renewed attention, and it is not improbable that encouraging practical demonstrations will there be given of its capabilities."

Coupling Steam and Water.

In coupling water and steam power to work together, it is usual to arrange the gearing or belting in such a manner that the water-wheel will run a trifle faster than the steam engine.

If there be a light load, the water will drive the shafting, allowing the engine governor to cut off and save steam. When a heavy load is applied, the speed decreases sufficient to allow the engine to take a share of the work.

The same object has been accomplished by connecting both steam and water motors to the main shaft by means of ratchet couplings. These couplings allow either engine or water-wheel to detach itself when speed of the other motor increases. When the speed falls to or below the regular figure, the ratchet couplings automatically reconnect themselves.

By microscopical examination it has been determined that many kinds of trees do not build up with wood equally strong each year.

During some seasons the structure is entirely lacking the fiber giving strength to the timber, and is composed of matter which seems merely to occupy space which would otherwise be vacant.

By a study of this growth, and knowing the years in which it was formed, valuable facts regarding strength of timber might be deduced.

A man "way down in Maine" has invented and patented a machine for catching fish, and the implement is said to work well at catching haddock.

If our Yankee brother would only provide a mechanical fish of adjustable length, and sure to bite, it would be appreciated by the weary angler as he wends his way homeward *via* the fish market.

The *Northwestern Miller*, in reviewing the situation at the Minneapolis flour mills, says:

"Heavy as were the flour exports of our mills for April, those of May exceeded them by over 30,000 bbls. and were undoubtedly never equaled before. In amount the exports for May were 297,900 bbls, including several thousands shipped to Canada, against 264,800 bbls for April, and 233,800 bbls for March."

Watch the automatic sprinkler. Do not wait until fire gets loose to find out whether the device will work or not. Sometimes rust or sediment will entirely close pipes in which water does not circulate, but stands a dead pressure until a fire occurs.

The dry-pipe system is liable to a similar stoppage in case leaks occur in the water valves. It is well to construct sprinkler systems in such a manner that the pipes can be readily drained, and the water changed.

Dr. Percey, President of the Iron and Steel Institute, says the London *Times*, recently stated that "before many years he looked to see Chinese iron and steel competing in the markets of the world.

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NEW YORK, JULY 17, 1886.

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Comforts for Workmen.

There are many proprietors of industrial establishments in this country that have made special provisions for the comfort and intellectual improvement of their workmen. We do not refer to ordinary sanitary arrangements about shops and factories, or the opportunity to make plans for executing difficult jobs. These matters are supposed to receive proper attention in every shop. Libraries and reading rooms are to be found in several well conducted establishments where the workmen can pass their leisure hours, or in some instances can take the books home. This, of course, is quite an expense to the proprietors, but they generally are satisfied that the investment pays indirectly by securing better educated service from the men. A somewhat novel plan of providing physical comforts for workmen has lately been instituted by the Hartman Steel Company, of Beaver Falls, Pa. They have begun to erect buildings for bath rooms and a coffee-house or lunch room combined. The men are to be furnished hot coffee and substantial lunch at all hours at a trifle over cost. They are also to have bathing facilities at a nominal sum. The company also provide a reading room in the second story. The whole is to be conducted by the Hartman Mills Relief and Benefit Association, into the treasury of which all the profits will go. The bathing part of the plan is not novel. Bath rooms are provided in other establishments; for instance, in the Brown & Sharpe Mfg. Co.'s works in Providence, where also may be found one of the best shop libraries in the country. The coffee and lunch department is the particular feature, which strikes us as being something worthy of adoption in every industrial establishment where facilities can be provided for it. Workmen generally have to be satisfied with a cold lunch, and it is hardly necessary to point out how much more satisfactory a warm lunch would be, or even hot coffee alone where circumstances will not conveniently admit of furnishing eatables. The Hartmann Company have taken advanced ground in preparing comforts for men who toil, and we believe it will be productive of much benefit, not only to their own employes, but as an example to others to do likewise.

Machine shop practice, even when well up in the use of a good class of ordinary machine tools, is generally lax in the use of milling and grinding machinery. Comparatively little use in proportion to value is made of either the milling or grinding machine. In many Western shops the milling machine does not have a place in the tool room; in Eastern shops its utility in the tool room is better understood. For bringing flat hardened surfaces to proper condition the surface grinding machine will in the end find its place in the machine shop, but it is as yet but little used. The mechanical world has rested satisfied with the planing machine, the advent of which was remarkable in its effect in cheapening machine processes. This machine will always hold its place, but milling and surface grinding machines will eventually be largely used to supplement its operations.

Troubles Caused by Unskilled Mechanics.

A reader sends us a long letter complaining about the men who get jobs in shops without having learned the trade, and who bring discredit upon skilled workmen who have applied themselves long years to acquire knowledge of the way to do work. He says:

"These are the men who are continually making the greatest troubles in our workshops and destroying that harmony and success which would be attained were they kept out of the shop. They are generally the instigators and cause of strikes, and seeking to incite men to dissatisfaction, whilst invariably they are are men who receive the most pay for the least work. Fill our shops with skilled workmen, men who understand their true relation to their employers, and there our troubles cease. Instead of a strike there would be a rational understanding, and no secret troubles would brew into serious results."

The writer of the above should know that employers are only too glad to fill their shops with skilled workmen, but it is not always easy to employ a sufficient number of that kind of men. Most of them leave to their neighbors the work of training apprentices, expecting to employ them after they have thoroughly learned the trade. The result is widespread disappointment. As far as our observation extends, those shops in which the proprietors take a sufficient number of apprentices and put forth suitable efforts to instruct them, are not troubled about filling their shops with skilled workmen, nor are they annoyed by strikes.

There seem to be about as many new industrial enterprises as ever starting up to secure business. Some which do not succeed make room for others. Within the last few weeks several new industrial plants have been sold at auction at a fraction of their original cost. One of these, at Schenectady, N. Y., was secured by the Edison Company, of this city, at a low price. That company intended to erect large works in Brooklyn, and secured a site some time ago and erected a foundry. Then the project lagged. We have heard that lack of means was the cause. But the opportunity to secure the McQueen Locomotive Works at Schenectady was more advantageous than to build anew. Some newspapers have published loud wails about the Edison Company taking their works from New York and Brooklyn because of strikes and labor troubles. We will present a big oil chromo to any one who will give us a logical reason why Schenectady has any peculiar exemption from strikes and labor troubles.

The harness manufacturers of the country having noticed traces of discontent among their workmen, which needed a check, recently decided to take the reins in their own hands, and therefore met in Pittsburgh and formed a National Association. There was considerable snap to the movement, and without a bit of discord they decided to all pull together. The association is expected to act as a holdback to the aggressions of workmen, who are now required to bridle their demands and buckle to their tasks without a murmur. It is said that the association has raised such a fund that there is no fear of its becoming strapped.

The plan of making weekly payments to workmen instead of monthly has made considerable progress in New England during the last year or two. In most cases monthly payments had been the rule. It became evident that weekly payments were better for workmen, preventing their running into debt for ordinary supplies and paying an extra price therefor. Employers seem willing to accommodate workmen as far as possible, and many have changed their pay day to once a week. In Massachusetts a new law went into effect July 1, requiring corporations to pay weekly.

"If you wish to put in an item to fill up, I send you the following," writes a shop foreman. We recognized the filling nature of the item, and deposited it in the waste paper basket with other matter of the kind. Thus we manage to "fill up" our waste paper basket every day. At the same time we receive much interesting matter that is written to convey information that our readers are glad to obtain rather than to fill space. This matter readily finds a place in our columns.

The way the people deal with monopolies in this country would be amusing if the consequences were not something worse. Take as an instance the supplying of gas in cities. When one company has worked its charges along to a point some three or four times beyond the value of the service the citizens move in the way of forming another company. All the old company has to do is to see that the stock is taken by the right parties, "consolidate" after a year or so, then gradually raise prices a few degrees higher than ever. The original monopoly is thus, by the help of interested citizens, enabled to increase its proportions at the least practical expense, getting new rights from the city that it could not secure by other means. The operation of gas companies is only cited as a familiar example. The same is true of many other things that require the surrender of some public rights to their use.

Those inventors who are employing their time on the problem of electric headlights for locomotives are more than likely putting it to unprofitable use. There is a growing feeling amongst engineers that the headlight, except for yard work and similar service, is rather a nuisance than otherwise. There is danger that by the time a good electric headlight is brought out the general abandonment of the use of headlights will have begun.

Whether for the best or not, the English practice of furnishing tools and machines to specifications of the buyer is gaining ground in this country. Locomotives are now almost entirely built to specifications from the mechanical departments of railroads, and even in machine tools building to specifications furnished is becoming much more common.

The future of Scotch pig iron in America is critical. For a year past sales of these brands has resulted in but little profit to the manufacturer or the importer. There is little evidence that the future will see any material improvement. Southern brands are likely in the future, more than in the past, to take the place of Scotch iron. It is simply one of the natural outcomes of the developments of the latent industries of the United States, and the protective policy of the Government.

Literary Notes.

"Poor's Directory of Railway Officials and Railway Directors" for 1886 is a new publication issued by the publishers of "Poor's Manual of Railroads. It contains lists of the officers and directors of all railroads in North America and of the leading organizations auxiliary to the railway system; also lists of officers of South American and British railroads, and much other valuable information useful to those dealing with railroad companies. There are a number of lists that can readily be referred to. The book has nearly 400 pages. It is published by Poor, White & Greenough, 45 Wall street, New York.

The Eccentric, for 1886, published by the students of the Stevens Institute is before us, and a very neat and tasteful magazine it is. It is embellished by engravings on wood and on steel. The matter is original and mostly eccentrical. Part is poetry and part prose. The following, which we cull from a lot of advice to young M. E.'s, reads very much like prose:

Don't engage, for the present at least, in journalism as a profession, if you have any other means of making a livelihood. Nine-tenths of the technical and trade papers of this country ought to be abolished at once, and most of them them will doubtless die an early and natural death as a consequence of the struggle for the survival of the fittest. They have a precarious existence, and there is no good reason why they were ever begun. There are not a dozen journals in this country that are really creditable to the engineering profession and its subsidiary trades. On these the services of young men are in demand, simply because the salaries that are available cannot tempt older men to identify themselves with them.

We did not know there was such a demand for fresh graduates of a technical school on technical and trade papers. We can assure the new graduates of Stevens Institute that they will have much difficulty in securing positions on any technical or trade paper to write mechanical or scientific articles, and the more "really creditable" the journal is the more difficult it will be to secure such a position at any salary whatever. If any of the fresh graduates wish to try journalism we advise them to commence by reporting on

a daily newspaper. Such positions can be had without much effort, but the young M. E.'s will find their level before two pay days come around. They will get no more for their services than they are worth, and the chances are they will have to draw upon reserve funds, for a few weeks or months, to pay board bills and buy satin neckties. But the discipline will be valuable if they can maintain their positions. It is much the same with graduates of technical schools as with technical journals. About nine-tenths of them never achieve anything worth note, and the other tenth work their way up to the higher ranks of the profession.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(270) J. C., Crawfordsville, Ind., asks: Where can I get a work describing all kinds of injectors? *A.*—There is no such work published.

(271) We should advise B. S., Charlotteville, Canada, to write to the manufacturer for the best cement to cement the rubber tire of a bicycle to the wheel.

(272) B. E. W., Atlanta, Ga., asks: Will you inform me how to make indelible ink for rubber stamps? *A.*—An ink, said to be very good, is made of 2 drachms manganese, 1 drachm lampblack, and 4 drachms powdered loaf sugar, rubbed into a paste with water.

(273) G. H., Philadelphia, Pa., writes: I have a lathe, boiler and engine at my house in the third-floor back room. Size of room, 10'x16'; joist, 3"x9", 16" from centers, 16' long. The boiler and engine and lathe weigh 2,400 pounds, and are supported on three of the joists. Is the floor strong enough to carry that weight, or can I add sufficient to the strength by bolting three 3"x8" joists to the ones that carry the weight, and then lay on 1½" yellow pine floor to cover 7' of the width of the room? *A.*—The floor timbers are ample for the load. By the plan you name, you might make the floor a little less liable to tremble when using the lathe.

(274) J. B., Boston, Mass., asks: 1. What is considered the best for a vertical engine, a rocking slide or a piston valve? *A.*—Either is considered satisfactory. 2. Will a boiler that is just large enough to run a 2"x3" vertical engine be sufficient for a 2½"x3"? *A.*—No. 3. Will a slide valve require more steam or power to work it than a rocker or piston valve? *A.*—That will depend upon the construction. For an engine the size named, you cannot improve on a slide valve. 4. Will a double crank be better than a disk crank on an engine than that of the size named? *A.*—Either will be satisfactory.

(275) J. J. G., Wheeling, W. Va., writes: I want to reduce the speed of my engine from 110 revolutions to 90. The driver is 36", the driven 30", and makes 135 revolutions. In making the change, I have figured on driving pulley 45" diameter. Is this right? *A.*—If you wish to keep the proportions just as at present, then 90 : 110 : : 36 : —44, that is, the driver should be 44" diameter. But

$$\frac{90 \times 45}{30} = 135$$

That is, a 45" driver will give driven pulley 135 revolutions. At present, revolutions of driven pulley would be

$$\frac{110 \times 36}{30} = 132.$$

(276) N. P. M., Colchester, Conn., writes: I have a Hancock inspirator in my charge which fed four boilers. Having had another boiler put in I removed the inspirator and put it in another place, to make room for the new boiler. Now the inspirator will not work at all. I have tried the inspirator in every way I can think of, but it is no use. What would be the best way to fix it? *A.*—We should overhaul the inspirator to see if anything has got into it, or got out of order. An inspirator should work equally well whether one or a dozen boilers were attached to it. Should you find nothing wrong about inspirator or piping, send the inspirator to the maker to be repaired. A man is kept by the makers who attends especially to testing inspirators. This man will probably know the trouble with your inspirator as quick as he hears steam or water enter it. 2. What is McVicer steel, and where can I obtain it? I had a piece of this steel sometime ago, and I could make tools from it which, without hardening, would cut threads on steel bolts. *A.*—We are not acquainted with the steel you name, but it appears to possess properties common to mushet steel, which would probably answer equally as well. 3. I want to plane up some zinc plates which are 6' long, 4' wide and ⅛" thick. My planer will take in only 30" wide by 24" high, and will plane 7' long. Is there any way to do the job? *A.*—It would pay the best to send the job to a shop where there is a big planer; or, if you had a lathe which would swing 7½ or 8 feet, the plates might be chucked and turned off. The job *can* be done on a planer, or, rather, beside it. Strip off the housing and bolt the work to a surface plate, which may be extemporized from any casting or material available, the only conditions being that the work is held free from strains, and true in plane with top of planer platen. Bolt a lathe-bed to top of platen, and let the bed project beyond the work sufficiently to rest upon a guide which has been rigged up in plane with top of platen. This guide will take the weight of end of lathe bed, upon which a slide rest is gibbed, and which carries the tool to plane the work. By mounting the lathe bed upon its side, and running the cross feed down as far as possible, the tool will be in position to reach the work. The feed may be managed by hand, or by attaching a lever and ratchet wheel to rod feed at end of lathe bed. 3. I also have a large gear, 47" in diameter, 6" face and 2½" pitch. Two teeth are broken, and I wish to put in two new teeth by dovetailing. Is there any method by which I can do the job on the small planer above described? *A.*—The job can be done with the same rig that was used for planing the plates. It can also be done by bolting the gear against one end of planer, bolting saddle of planer to platen, and using a tool which will reach the work. 4. I formerly mended a similar gear by drilling two holes and putting in steel studs, but it split the gear as soon as strain was put upon it. I intend to plane the dovetails 9-16" deep; width equal to widest part of tooth, and bevel 15 degrees. Is that about right, the new teeth being made a driving fit? *A.*—If the steel studs had been screwed in and slightly riveted, they would, in our estimation, answer better than the dovetailed teeth. However, if a small rivet be put through each tooth thus put in the gear may do considerable service when mended as you describe. 5. How often should a boiler be blown off, and safety valve raised? *A.*—It depends altogether upon the quality of water used in regard to blowing off. With some water, once a week is none too often; but with other water, a month or two may pass before the boiler needs cleaning out. A safety valve should be raised from its seat every morning and every noon. Feed-water heaters should be blown off as often as the sediment collected demands it. 6. How much coal ought to be used in four boilers supplying one 450, one 12, and one 2 horse-power engine; also one 8"x12" steam pump. The boiler pressure is 75 pounds? *A.*—Nothing whatever can be told about this without knowing the kind of engines and boilers, and other particulars. Some engines will require six pounds of coal per horse-power per hour, others two or three. Some boilers will evaporate ten pounds of water per pound of coal, other five pounds. 7. What would be the difference if 60 pounds of steam is carried? *A.*—It may require more or less coal, according to conditions. 8. I sent off for a gear some time since. It was, as I thought, 2¼" pitch. I got a postal card that the makers did not make a pitch larger than 1 5-16". As they made the gear in question, I don't understand how the 1 5-16" pitch comes in. I measured from inside of one tooth to outside of next, which made it exactly 2¼" How should I measure? *A.*—The pitch of gears must be measured on the "pitch line" or circle, which in equal gears will be two equal circles, one on each gear, which just touch, or are tangent to each other. This line or circle is roughly estimated to be one-third the distance from top of tooth to bottom.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

"Modern Steam Engines," $6; "Mechanical Drawing Self-Taught," $4 Joshua Rose, Box 3306, N. Y.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

Veneer machines, with latest improvements, Farrel F'dy & Mach. Co., Ansonia, Ct. Send for circular.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See June 19, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Wanted—Numbers 1, 2 and 4 of volume IV., 1881: must be in excellent condition for binding, if soiled we cannot use them; for copies described as above we will pay 25c. each, and prefer to have the whole three if possible. Parties favoring us will kindly write name and address on wrapper. AM. MACHINIST Publishing Co., 96 Fulton street, N. Y.

"Hints to Steam Users." A carefully prepared book on the care and management of steam boilers. Especially valuable to owners, engineers and firemen. Contains useful information, tables, rules, etc., etc. It is the best book ever issued for the price. Send 25 cts. in stamps to Steam Users Publishing Co., 30 Vesey street, N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES.

Weed, McLoughlin & Co., of Hurlby, Wis., will build a $50,000 saw-mill.

The Baltimore & Ohio Railroad will build a new round-house at Port Deposit, Md.

Thomas B. Peddie, Newark, N. J., will erect a five-story brick trunk factory on Canfield Alley.

Lazarus Silverman will erect a five-story factory, 75x100 feet, at 1237 Grimshaw street, Chicago.

John Dwyer, Newark, N. J., will erect a four-story brick leather factory on Ferguson street. Cost, $17,000.

Richard Church will erect a machine shop in Birmingham, Ala. He has purchased land of the Elyton Land Co.

The Cincinnati, Hamilton & Dayton Railroad will probably put some new machinery into their shops at Lima, Ohio.

A company will be organized at Joshua, Texas, soon to build a roller flour mill. Several thousand dollars have been subscribed.

Ashland, Wis., will have a new charcoal blast-furnace. Hon. S. S. Fifield, of Ashland, is interested in the enterprise.

H. C. Nichols, 1509 Montrose street, Philadelphia, has a permit to erect a four-story factory, 57x56 ft., at Rowland Court and Seventh street.

W. H. Green (Vulcan Works), Chester, Pa., is putting on the market a line of safety valves manufactured under the "Orme" patents.

The Valley Iron Works, Williamsport, Pa., are busy building automatic engines. They report inquiries numerous and encouraging.

The popularity of roller skating rinks is a thing of the past. Rumsey, Daniels & Skinner, of Homer, N. Y., will turn the rink in that town into a wire mill.

It is stated that the Georgia Midland, and the Macon & Covington Railroads will be built to Athens, Ga., and that the shops of both roads will be located there.

Thomas F. Rowland, of Greenpoint, Brooklyn, N. Y., and others, have incorporated the Strong Locomotive Co., at Glen Ridge, N. J. Capital stock, $1,200,000.

New Hampshire is not quite a prohibition State, but C. M. Lufflin, of Alstead, in that State, has purchased a cider-mill property, and will convert it into a plow factory.

J. Lonergan & Co., 211 Race street, Philadelphia, manufacturers of a number of steam engine and locomotive specialties, report a good and steadily increasing business.

Forbes & Curtis, Bridgeport, Conn., are about to build a new shop, so as to get all the work on one floor. It will be 135x135 feet, with extensions for office and boiler house.

The Standard Horse Nail Company, formerly of Fallston, Pa., are rebuilding their factory, which was burned some months ago, at New Brighton. The establishment will cover nearly an acre of ground.

Bussey & McLeod, Troy, N. Y., propose to move a portion of their works. A proposition has been made by citizens of Bath to raise $30,000 to purchase a site as an inducement for the firm to go there.

The plans and specifications for the new factory of the Broderick & Bascom Rope Company, in St. Louis, are being drawn. Building operations will be begun next month, and prosecuted vigorously.—*Age of Steel.*

E. A. Walker, 75 Laurel street, Philadelphia, manufactures combination planers and shapers, which, being different from the general variety of machine tools, requires actual use to prove their value. He has just issued a circular with some high testimonials from parties who have used the machines.

Jones & Laughlins, of the American Iron Works, Pittsburgh, will at once rebuild their foundry, burned the 12th of June. The new building will be fireproof, and will be 210 feet in length and 104 feet wide.

The Kellogg Steam Power Co., of Pittsfield, Mass., spent $54,000 for buildings and machinery, and had eleven acres of land given to them. A week or two ago the whole property was sold at auction for $18,250.

The Hoppes Mfg. Co., John J. Hoppes president and manager, has recently been organized at Springfield, Ohio, and are building new works and putting in machinery to manufacture the Hoppes feed-water heater and lime extractor.

The Stamford Pouncing Paper Co. has been incorporated in New York City. They will probably make a quality of newspaper suitable to those daily and weekly sheets that make a practice of pouncing upon somebody every issue.

The Rusk Penitentiary, Rusk, Texas, has a new iron-pipe foundry nearly ready to run. No chance for a private pipe foundry to compete with them. When bids for pipe are called for, one such institution can demoralize the market.

The National Water-Tube Boiler Co., of New Brunswick, N. J., is meeting with good success in introducing the Moore boiler. A late sale is a 70 horse-power boiler just put in for the Oneida Community, Oneida, N. Y.

The Mitis Wrought Iron and Steel Co., Philadelphia, have selected a building site, and will erect works for the production of "Mitis" wrought iron and steel castings. Pedro G. Salom, of 208 South Fourth street, is secretary.

Palmer, Cunningham & Co., Limited, is the name of a new firm engaging in machinists' supply business, at 607 Market street, Philadelphia. The members of the firm are experienced "supply" men. A gear-cutting attachment, the inventor of which, J. C. Palmer, is now head of this firm, was illustrated in our issue of February 6, 1886.

Remington & Co., Wilmington, Del., now employ 66 men in their various specialties, including the manufacture of the Harrison flue-hole cutter, and building steam pumps on contract for the Hall Steam Pump Co., of New York, 80 pumps being now under way, and all reported sold. A two-story addition, 40x63 feet, was made to the Remington shop during the past year.

Bement, Miles & Co., Philadelphia, are bringing out what, in shop terms, they call a "combination" planer; that is to say, certain features are as heretofore used in the "Bement," and others as used in the "Miles" planer, as built respectively by the two firms now consolidated as above. The aim is to produce a planer which will combine the best points of both styles.

The United States Mitis Company, the organization of which under New Jersey laws we noticed last week, has opened an office at 26 Broadway, New York. W. F. Durfee, an engineer well known in the iron and steel industries, is general manager. A factory is to be started in Jersey City for the manufacture of the "physic" or alloy of alluminum used by licensees in the maufacture of "Mitis" castings. Aside from this, this company will confine its business to issuing licences.

The Keystone Light and Power Co., 108 S. Sixth street, Philadelphia, M. R. Muckle, Jr., secretary and treasurer, have twenty wiremen at work wiring the offices of the *Press*, *Times*, and *North American* newspapers in that city. They are to lay wires underground to light a section of the city by the Westinghouse incandescent system. Present capacity of plant, 2,200 lights of 10 candle-power each. They propose to increase their plant one-half by fall.

The M. C. Bullock Mfg. Co., of Chicago, report recent shipments as follows: One little champion diamond drill, with complete outfit, to the City of Mexico; one climax diamond drill, with complete outfit for underground prospecting, to the Lake Superio rIron Co., Ishpeming, Mich. (This makes the third Bullock drill purchased by this company); one straight line engine to Carson, Pirie, Scott & Co., of Chicago. (This is the third straight line purchased by this firm); one little champion diamond drill, with outfit, to the Hudson River Ore and Iron Co., Burden, N. Y.; One special No. 6 Lane's patent portable hoist for a silver mine in South America.

The Southwark Foundry & Machine Co., Philadelphia, is doing a good business, having 400 men at work in the various departments on Porter-Allen and Southwark engines, rolling-mill and blast-furnace work, boilers, hydraulic machinery, and other specialties. A Hilles & Jones shearing machine is the latest addition to the boiler-shop plant. New help is being added daily, and we are informed by the president, Robert C. Cornelius, that the company expects to add one or two hundred more men to the working force during the next two or three months.

J. A. Fay & Co., Cincinnati, Ohio, have issued a new illustrated catalogue of labor-saving woodworking machinery, for the building of which they have a reputation throughout the civilized world. The catalogue is a model, both in fine, clear engravings, superior print, concise, intelligible descriptions and good taste in general arrangement. There is no effort toward over-ornamentation on any page. There is a good index, and the work is one of ready reference. They make over 300 different machines, the largest of any wood-tool builders in the world. All are illustrated and described in the catalogue. The catalogue will be sent to any one for $1, in stiff paper cover, or for $2 bound in cloth.

Machinists' Supplies and Iron.

NEW YORK, July 1, 1886.

While general trade has shown considerable improvement during the past week, dealers in supplies do not admit any noticeable change.

Iron—In American pig the demand in the better brands is about equal to the production. Inferior brands are not so easily disposed of, and considerable urging of sales is done. The prospect for future trade is generally looked upon by furnacemen as hopeful. We quote No. 1 X Foundry $18 to $18.50 for Standard Lehigh and North River brands; $17 to $17.50 for No. 2; and $16 to $16.50 for Grey Forge.

Scotch Pig—There are very moderate sales of these brands. Prices rule, Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50 to $18; Langloan, $19.50, and Dalmelington, $18.50.

Lead—The market is firm at 4.90c., but there is lack of disposition of buyers to pay this price.

Copper—Sales of Lake, at retail, are reported at 10⅛c. to 10¼c., but 10c. is generally offered.

Tin—Fluctuations in London tend to unsettle the market here. Jobbing lots of Banca have sold at 23¼c.; Straits and Malacca, 23c.

Spelter—Refined, 5¾c. to 6c.

Antimony—Hallett's 8¼c.; Cookson's, 8½c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation as superintendent or foreman of iron or agricultural implement establishment; qualifications and references the very best. Address X. X. L., AM. MACHINIST.

Wanted—An assistant instructor in mechanical engineering; several years' practical experience in drafting room, foundry, blacksmith and machine shops necessary. Send terms, references and full statement of past occupations to Box 495, Bethlehem, Pa.

Wanted—Foreman for printers' machine shop; a man capable to superintend repairs of all kinds on presses, cutters, etc.; also general jobbing and constructing; one with some cash can have interest; business has been established several years; has good run of trade; modern tools in shop, and experienced men only employed; references required. Address "Printers' Machinist," AM. MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound has been used 40 years and still the best. Crescent Mfg. Co., Cleveland, Ohio.

The Cyclone Steam Flue Cleaner is king, and has no rival. Crescent Mfg. Co., Cleveland, Ohio.

Steel stamps, stencils, burning brands, and brass checks. T. M. Parker, Hartford, Conn.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

Send for estimates of high-speed compound engines for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

For Sale—Corliss engine drawings; complete in every respect; if sold at once, can be had at a very reasonable price. Address Z. X., AM. MACHINIST.

Wanted—Machine shop in every city to apply the Kimball pendulum cut-off governor to old engines. Kimball Bros., Anamosa, Ia.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Every draftsman should send 50 cents to Wm. A. Emerson, Fitchburg, Mass., and receive by return mail full instructions in face and figure drawing, including 17 diagrams. July 10.

Wanted Immediately—A first-class machinist, with some capital, to take half interest in machine business; also cider and jelly factory. Address at once for particulars E. F. Kelly, Cairo, Tuscola, Co., Mich.

For Sale—10×20 horizontal engine, cut-off valves, heater, pump, etc., complete; this engine has been in use 3 months, and is a finely built engine; made by Whitehill, of Newburgh, N. Y., and for sale cheap. Shultis & Co., Kingston, N. Y.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contractfor the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

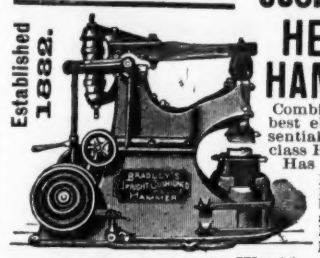
For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

Wanted—A practical machinist, with some capital, to take partnership and entire charge of a machine shop equipped with new tools; a foundry doing a large business will be run in conjunction with same. Murray & Stevenson, Aniston, Ala.

Wanted—A first-class man, with strictly temperate habits, to buy ⅓ or ½ interest in sash, door, blind and furniture factory; well equipped; desirably located between two trunk line railroads; fine opportunity for the right man to take charge of and run the business: all new machinery; entire plant and grounds worth $12,000. Address T. M. Draper, Oxford, Ala.

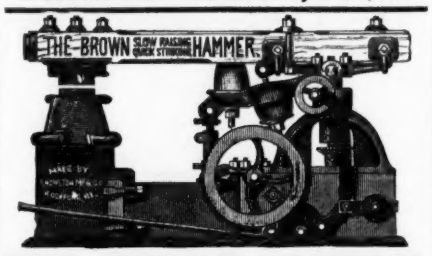
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1882.



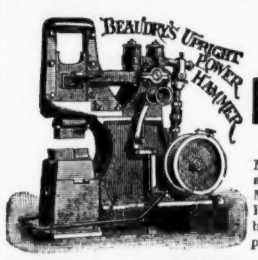
Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.



THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises The Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER



The success of our Machine is the best guarantee of its value. Only Machine with Double Helve. Does more and better work with less repairs than any other.

BEAUDRY & CUNNINGHAM, Boston, Mass.

STEPHENS PATENT VISES.

50 Per Cent of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper pipe, and other attachments. Sold by the trade. Send for circular.

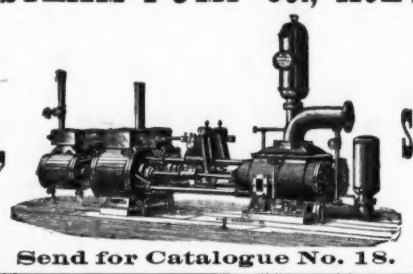
MELVIN STEPHENS, Prop'r.
Office, 41 Dey St., New York.

A LIBERAL PROPOSAL
To Pattern Makers:
IF YOU WILL ATTACH A
MASSEY'S E & K PATENT VISE
To your bench, and it does not satisfy you,
Saving Screwing,
Jaws Always Parallel, Instantaneous Grip,
Saving you more Time and Labor in two month's than will pay for its
COST,
YOU MAY RETURN IT AT MY EXPENSE,
T. C. MASSEY,
81 John St. NEW YORK. 11 to 23 So. Jefferson St. CHICAGO, ILL.

J. WENDELL COLE, M. E.
Manager of Pennsylvania Southern Lake regions and the Northwest for
DETROIT EMERY WHEEL CO.
Address, Box 84, Columbus, O. or P. O. Box 152 Chicago.
Hart's Corundum-Emery Wheels

THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



Send for Catalogue No. 18.

THE M. T. DAVIDSON IMPROVED STEAM PUMP

MANUFACTURED BY
DAVIDSON STEAM PUMP COMPANY.
WARRANTED THE BEST PUMP MADE FOR ALL SITUATIONS.
PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.
NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.

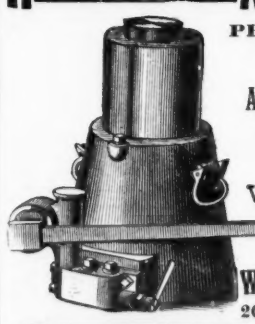
S. ASHTON HAND MFG. CO.,
Toughkenamon, Chester Co., Pa.
MAKERS OF FIRST-CLASS
ENGINE LATHES
Are now in position to put on the market
14" ENGINE LATHES OF NEW DESIGN,
guaranteed to be equal in material, design and workmanship to the best ever offered.

EMERY-WHEEL TOOL GRINDER.
Four Sizes.
Guaranteed Satisfactory
Write for Illustrated Circular.
Pat. Sept. 25, 1883.

SPRINGFIELD GLUE & EMERY WHEEL CO., Springfield, Mass
Water runs on wheel and prevents heating.

STEWART'S IRON FIBRE PAINT
COLORS RED AND BROWN.
For painting ROOFS, FACTORY and FARM BUILDINGS, FENCES, IRON WORK, EXPOSED BRICK WALLS, &c. Made of Pure Linseed Oil and highest grades of Iron Oxide. Send for Circular. Address
W. H. STEWART,
74 Cortlandt Street, New York.
READY ROOFING, for new roofs.

HYDROSTATIC MACHINERY



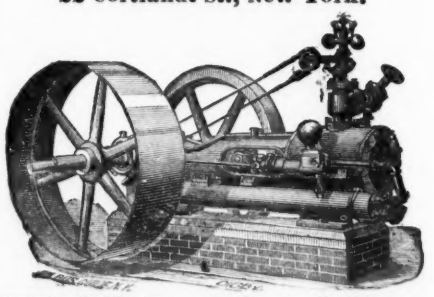
PRESSES, PUMPS, PUNCHES, ACCUMULATORS, JACKS, VALVES, FITTINGS, Vault Elevators, &c.&c.
Watson & Stillman,
204-210 E. 43d St., N.Y.

H.W. JOHNS' ASBESTOS ROOFING
FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS ETC.
Samples and descriptive Price List free by mail.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.
CHICAGO, PHILADELPHIA, LONDON.

GUILD & GARRISON,
BROOKLYN, N. Y.
STEAM PUMPS,
VACUUM PUMPS,
AIR COMPRESSORS.
SEND FOR CATALOGUE.

FOR SALE AT A BARGAIN.
A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock; situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,
A. FALKENAU,
Care of Dickson Mfg. Co.,
Scranton, Pa.
Only reason for selling, ill health.

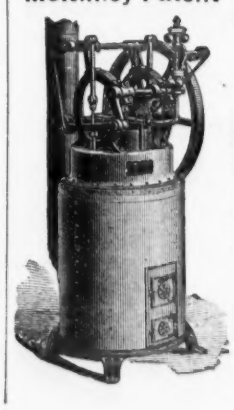
IF YOU WANT A STRONG, ECONOMICAL
ENGINE,
Either *Horizontal* or *Vertical*,
For steady every-day and all-night service, and at a *Low Price*, write to
COOKE & CO.,
22 Cortlandt St., New York.



Twelve hundred Engines in use Please mention this paper.

THE HENDEY MACHINE COMPANY.
MANUFACTURERS OF
TORRINGTON, CT.
SEND FOR CATALOGUE
Machinists' Tools, LATHES, PLANERS, SHAPERS, DRILLS, ETC., ETC.

McKinley Patent



AIR ENGINE
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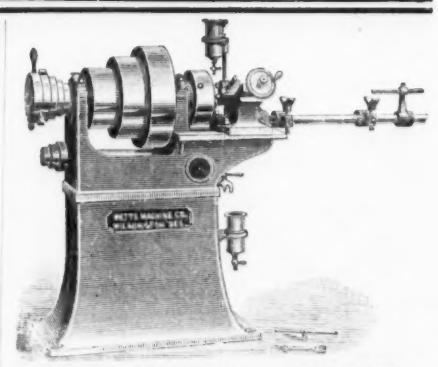

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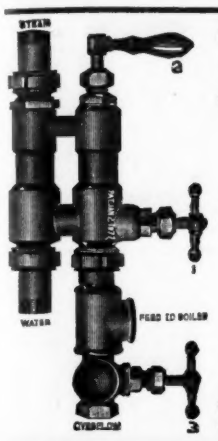

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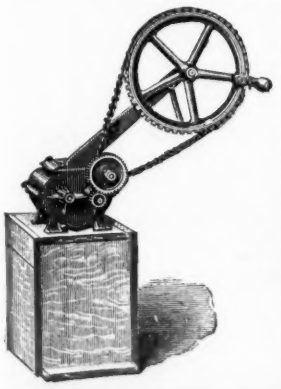

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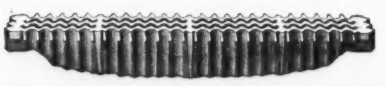

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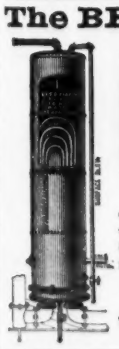

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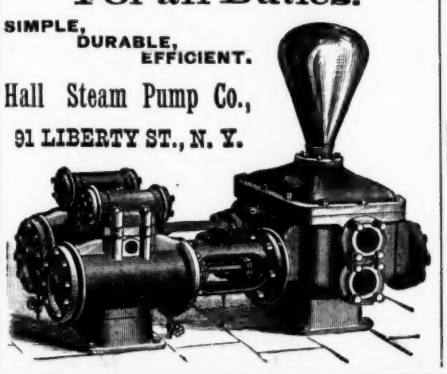

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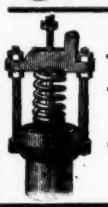

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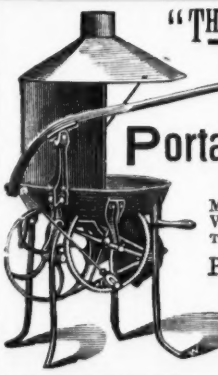

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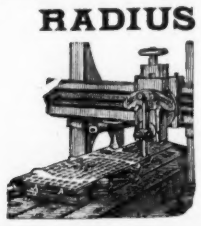
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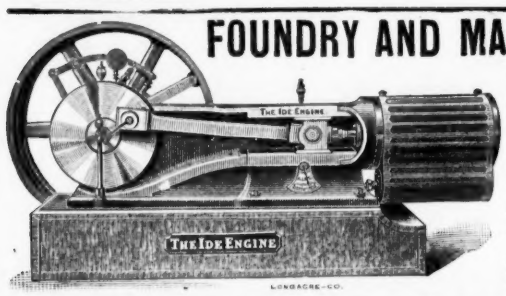

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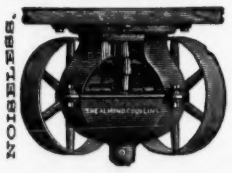
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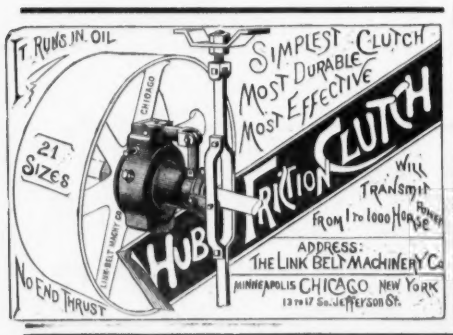

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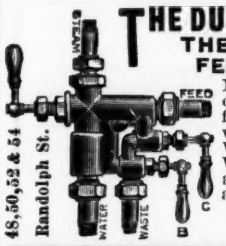

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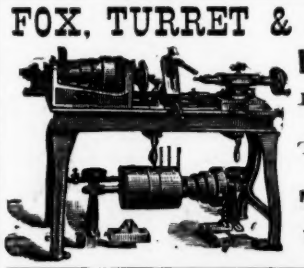
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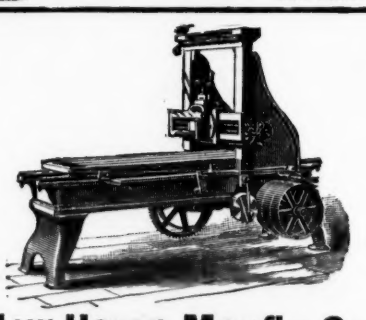
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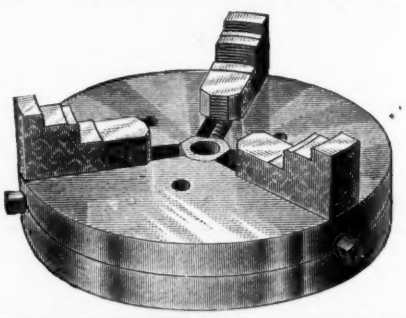
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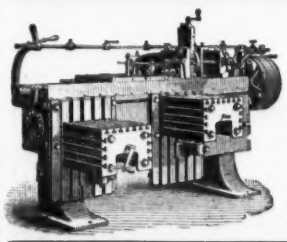
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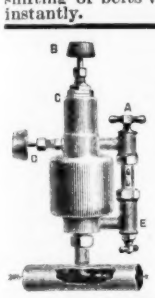

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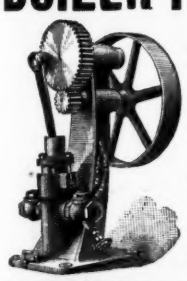

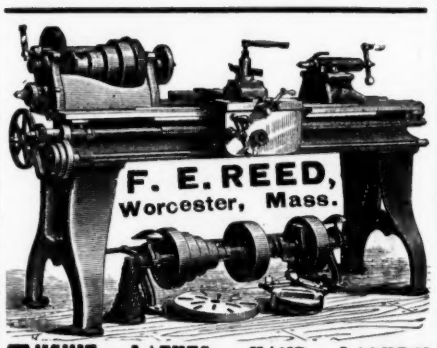

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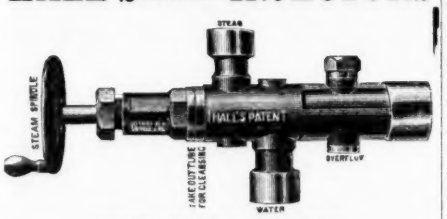

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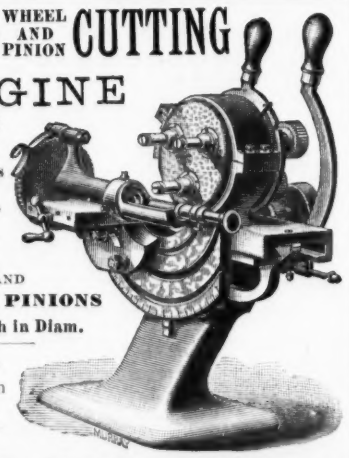

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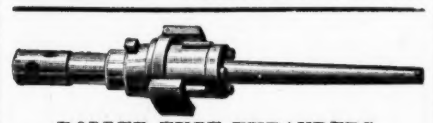

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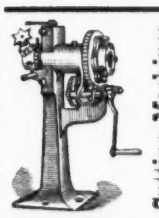

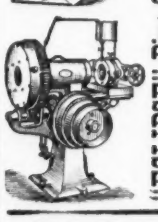

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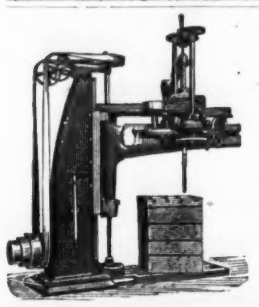

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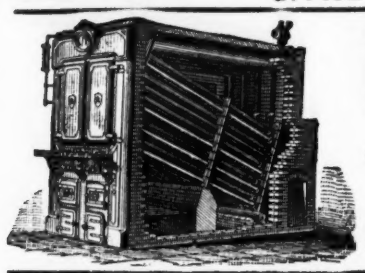

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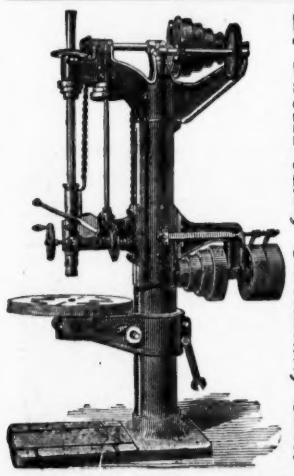

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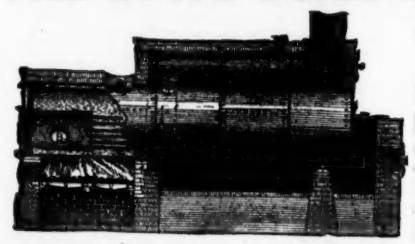

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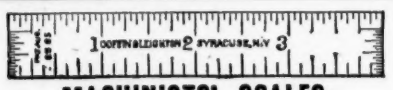

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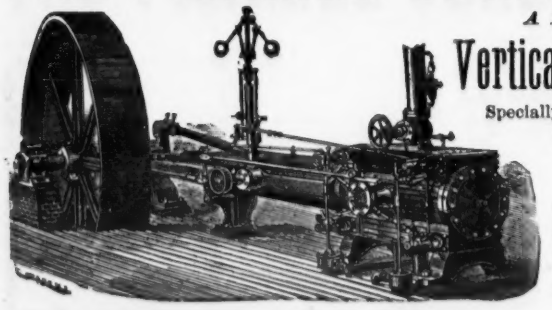

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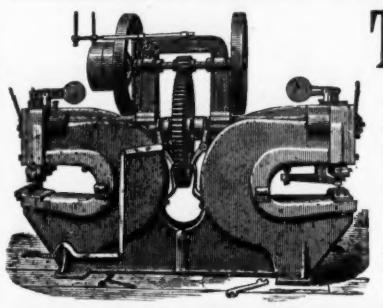

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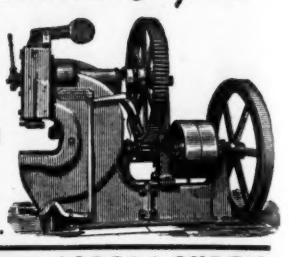

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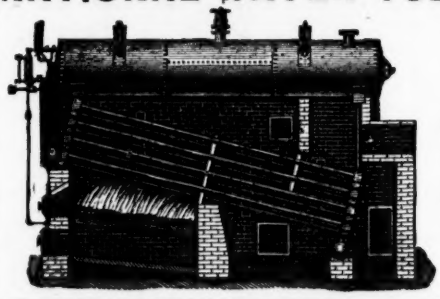

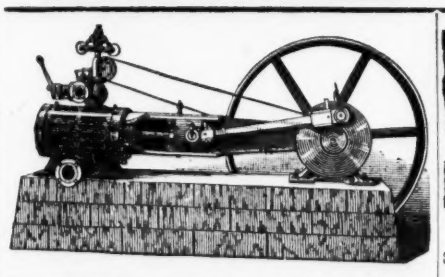

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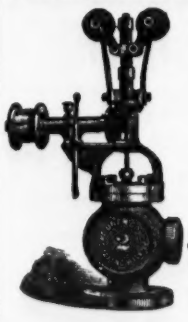

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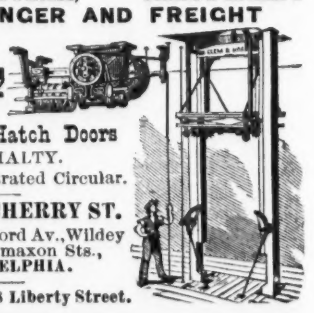

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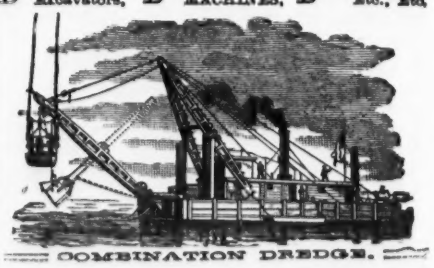

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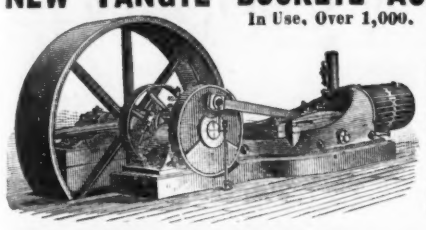

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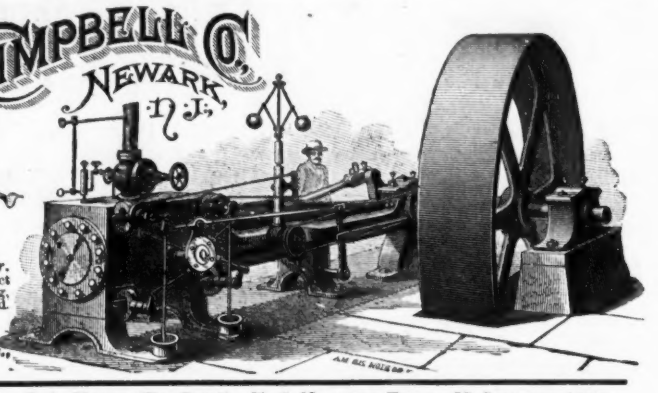

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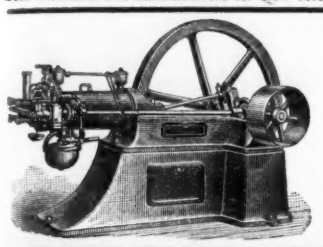

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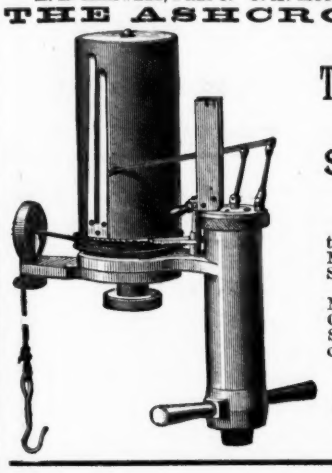

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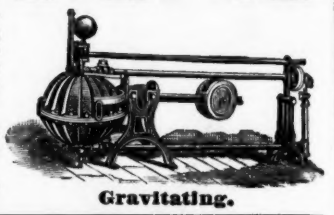

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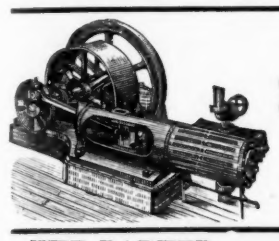

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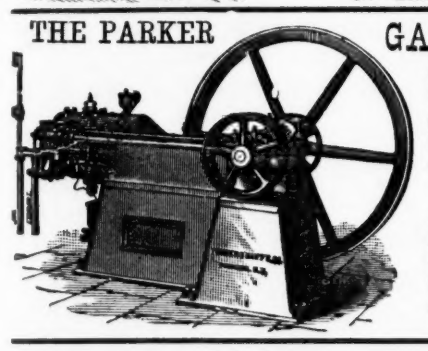

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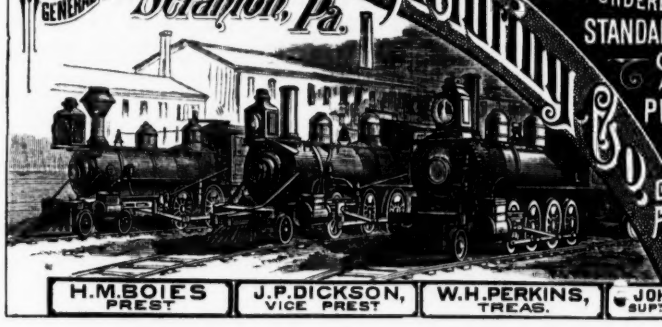

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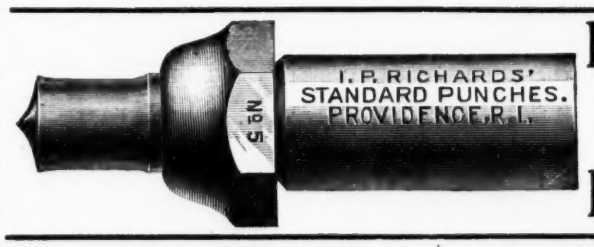

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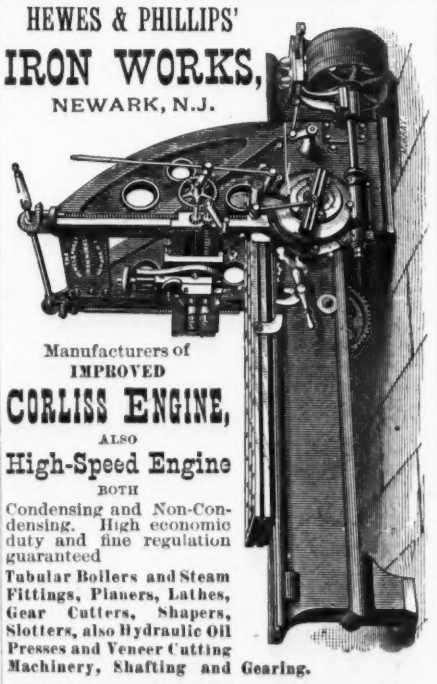

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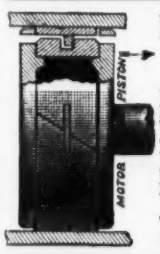

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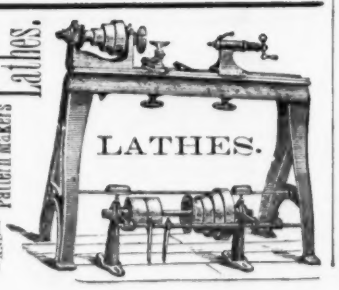

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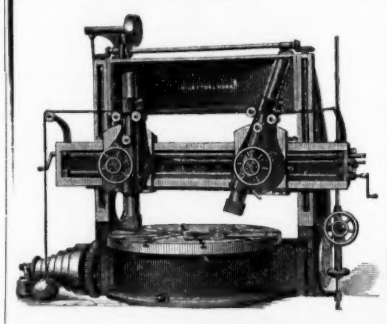

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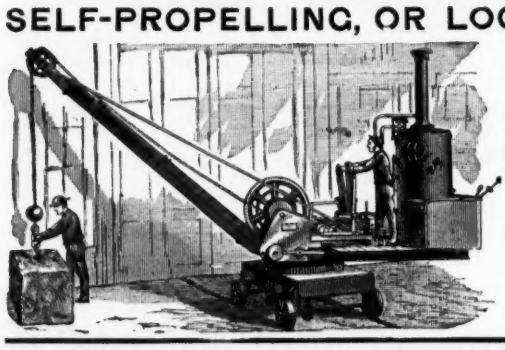

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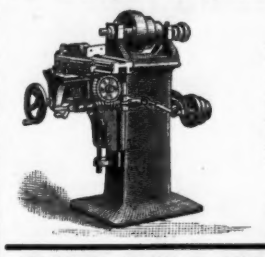

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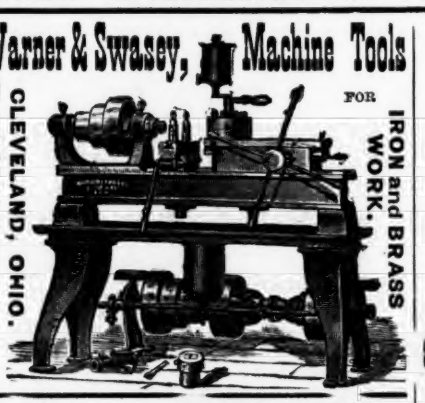

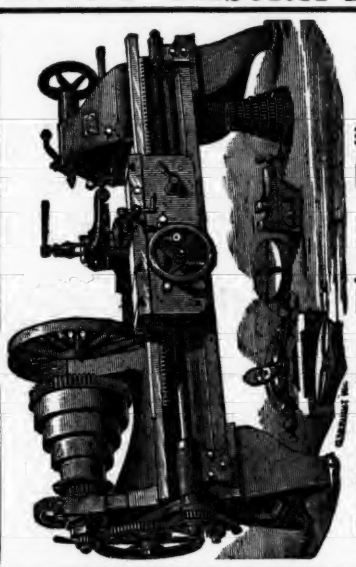

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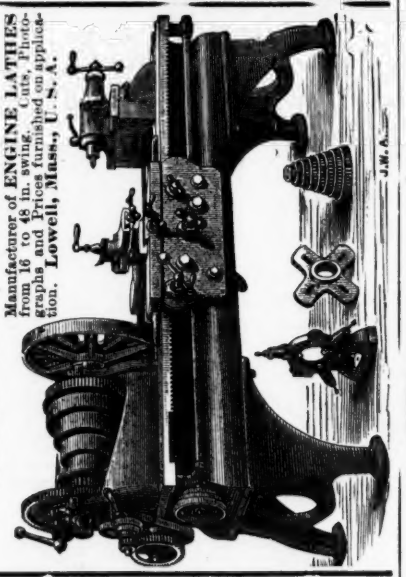

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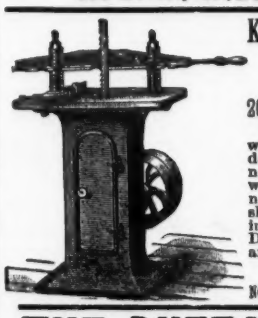

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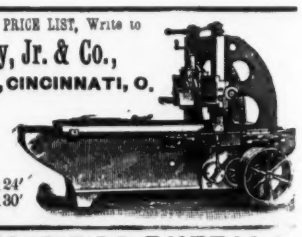

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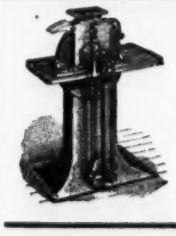

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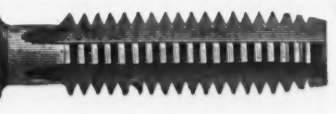

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